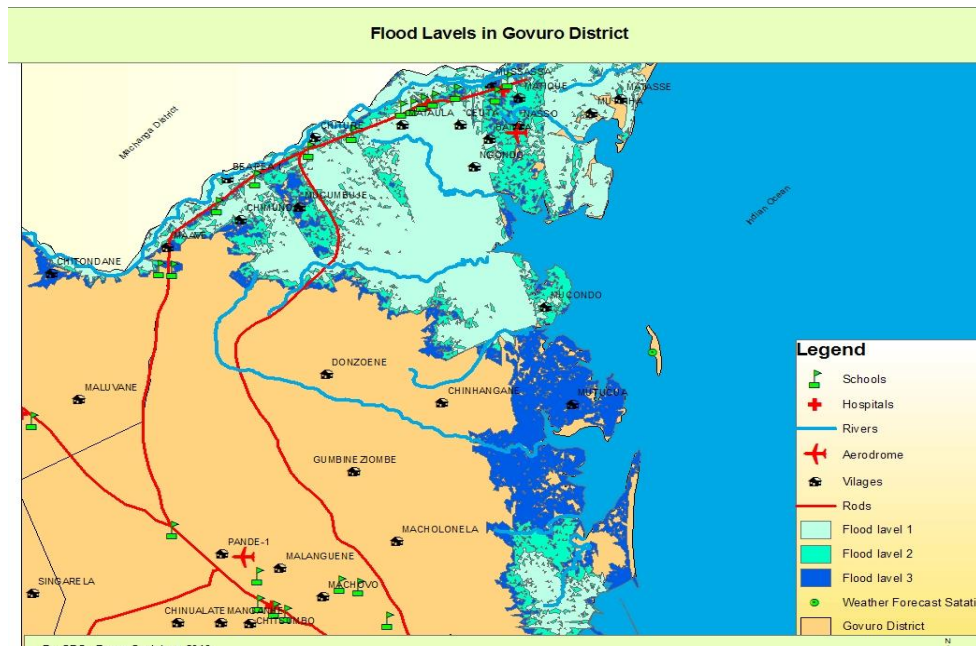




Republic of Mozambique  
MINISTRY FOR THE COORDINATION OF ENVIRONMENTAL AFFAIRS  
CENTRE FOR SUSTAINABLE DEVELOPMENT OF COASTAL ZONES



Situational Description (State of the Natural Resources and Socio-Economy), Zoning and Management Plan for Natural Resources in Govuro (Nova Mambone Administrative Post)



CDS ZONAS COSTEIRAS, 2011

SUPPORTED BY

CC DARE: Climate Change and Development – Adapting by Reducing Vulnerability

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**ACRONYMS**

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- APEGO - Govuro Fishers Association
  - CC DARE - Climate Change and Development - Adapting by REducing Vulnerability
  - CDSZC - Centre for Sustainable Development of Coastal Zones
  - EN - National Highway
  - FCC - Fisheries Community Councils
  - GDP - Gross Domestic Products
  - GPS – Global Positioning System
  - HEC - Human-Elephant Conflict
  - MPFS - Master Plan for the Fisheries Sector.
  - NFAC - National Fisheries Administration Commission
  - Km – Kilometre
  - MAE – Ministry of State Administration
  - MICOA - Ministry for Coordination of Environmental Affairs
  - NAPA - National Adaptation Programme of Action
  - NGO - Non Governmental Organization
  - PCC - Provincial Co-management Committee
  - US - United States
  - UN - United Nations
  - UNEP - United Nations Environment Programme

## SUMMARY

In April 2010 a survey was conducted in Govuro (Nova Mambone Administrative Post), to determine the felt needs of local communities identify new economic opportunities and access their use of natural resources. Around 34,000 people live in Govuro and they have a subsistence livelihood which is highly dependent on the use of natural resources.

The main objective of this survey was to develop a preliminary proposal on socioeconomic context, zonation and management plan for natural resources. The Zonation was done for flooded areas and distinct management unities in Nova Mambone Administrative Post, so that the multiple-use goals of habitations, agriculture, conservation, tourism and utilization by communities can be achieved. All habitat types in the Nova Mambone were mapped and their relative value for the three last activities was compared, after having completed a natural resource use assessment in the area.

The majority of the population in the study area is involved in agriculture, fishing and livestock rearing as key economic activities.

More than 30 different natural products are collected from the bush and contribute to the regular economy and life of the communities in Nova Mambone Administrative Post. These included vegetable and mineral products used in construction and nutrition, plus some additional important vegetable products, mainly woods (boat construction, firewood, musical instruments) and also dyes.

The resulted map of flooded areas has been qualitatively ranked into three levels, namely, level 1 (low), level 2 (moderate) and level 3 (high) flood hazard zones. The most frequent floods in Nova Mambone are of level 1 and 2 respectively.

The areas with the most conservation value comprised mangroves, which are nursery areas for many marine species; coastal forest, which is a hotspot where a high level of endemism is expected to be found; floodplains, grasslands and lowland forests which constitute an important mammal reservoir area. Except for a seasonally used farming area along the Save river, all these habitats were largely less disturbed and can offer the most tourism potential.

Wildlife in the district includes endangered species such as elephants and wild dogs. The four largest antelopes found regularly in the district were identified as waterbuck, sable, reedbuck and kudu. Traditions, uses and beliefs associated with some wildlife species were also discussed, although the issue of hunting needs to be further studied.

Habitats that were most valuable to local communities comprised the coastal and marine, which supports most fishing activities, the farmlands located close to the villages and the mixed woodland surrounding these areas where local people extract natural products. More than 30 different types of natural products were identified as contributing to the

regular life of communities, mainly for construction, nutrition and other uses. Other plant species were also established as being regularly collected by communities, being used for more than two purposes.

The zoning proposal for the district comprises flooded areas, core wildlife area including the areas with the highest conservation value and lowest local value, where no extractive use of natural resources can take place, surrounded by a community wildlife area where resource use occurs but needs to be controlled through community-based mechanisms.

## 1. INTRODUCTION

This study provides a brief description of the socio-economic conditions, natural resources and zonation in Nova Mambone Administrative Post. It includes, among other issues, a description on population, infrastructures, habitats, natural resources, social-economic attributes and management plan of natural resources.

The main objective of this survey was to develop a preliminary proposal on socioeconomic context, zonation and management plan for natural resources. The Zonation was done for flooded areas and distinct management unities in Nova Mambone Administrative Post, so that the multiple-use goals of habitations, agriculture, conservation, tourism and utilization by communities can be achieved. All habitat types in the Nova Mambone were mapped and their relative value for the three last activities was compared, after having completed a natural resource use assessment in the area.

Information in this document was obtained by conducting detailed surveys in the project area between March and April in collaboration with the local technicians and other organizations. However, it must be emphasized that the current information on socioeconomic context, natural resources and their uses needs to be constantly updated and that the management of the area has to follow an adaptive approach, by which solutions to both ecological and social problems are monitored and reviewed.

The study found that the communities in Nova Mambone rely heavily on natural resources which are harvested from different habitats such as forests, estuaries, mangroves and the inshore waters of the sea.

More than 30 different natural products are collected from the bush and contribute to the regular economy and life of the communities in Nova Mambone Administrative Post. These included vegetable and mineral products used in construction and nutrition, plus some additional important vegetable products, mainly woods (boat construction, firewood, musical instruments) and also dyes.

The resulted map of flooded areas has been qualitatively ranked into three levels, namely, level 1 (low), level 2 (moderate) and level 3 (high) flood hazard zones. The most frequent floods in Nova Mambone are of level 1 and 2 respectively.

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This report is divided into nine sections: Section 1 is an introduction and section 2 explains the methodology used for data gathering and analysis. Section 3 provides an



overview of the study area and section 4 the physical environment. Section 5 describes the natural resources while specific socio-economic features of the district and Nova Mambone in particular are described in section 6. A summary of main problems are presented in section 7. The description of zonation of Nova Mambone is detailed in section 8. and a management plan for natural resources is in section 9.

## 2. METHODOLOGY

### *2.1 - Information gathering*

The task of data gathering comprised two steps, namely: a literature review and contacts with district informants followed by field work. Each of these steps will be described below.

### *2.2 - Literature review*

The principal objective of the literature review was to obtain an overview of the general features of the study area. Issues such as population dynamics, socio-cultural features as well as economic activities were compiled.

### *2.3 - Field work*

The field work consisted in three main activities, namely: Georeferencing of infrastructures, focus group discussions and individual interviews.

The focus groups and individual interviews were held in the most populated villages. In Nova Mambone locality, this work was carried out in Matasse, Matique, Batata, Mataula, Ngondo and Chimunda. In Pande Locality, this work was held in Pande 1, Manganhe, Chitsumbo and Chinhocane. In all these villages, the focus groups involved fishers and farmers, both man and woman. The fishers were selected according to the following criteria: type of gear they use, type of service they provide, their experience in artisanal fisheries, their origin (Mozambican, foreign, local or immigrant), and their availability to participate in focus group sessions. On average each focus group session took two hours and was conducted by the CDS ZC team and 3 local technicians (extensionists) who were trained locally. The issues discussed during the focus groups were as follows:

- Human settlement
- Main activities in the area
- Social and political structures;
- Income from the fisheries;
- Fish markets, demand and supply
- Infrastructures
- Environmental problems
- Use of Natural Resources
- Climate change and
- Other issues.

Participatory and mapping techniques were also used. Maps were first drawn on flip charts or on the ground. Both were transposed onto paper together with the group and designations were written to describe each location. Some designations used are

traditional and sometime don't appear on conventional maps. The use of focus groups in this study proved to be a useful choice. The groups interviewed were comfortable to provide relevant information and the methodology encouraged the informants to discuss several issues that were not raised during the individual interviews.

The individual semi-structured interviews considered social and economic aspects. The social discussion was held to gain information about individual perceptions regarding the climate change and their impacts. The economic component discussed details regarding the agriculture and fishery productivity, incomes and profit levels.

#### *2.4 - Surveys of infrastructures*

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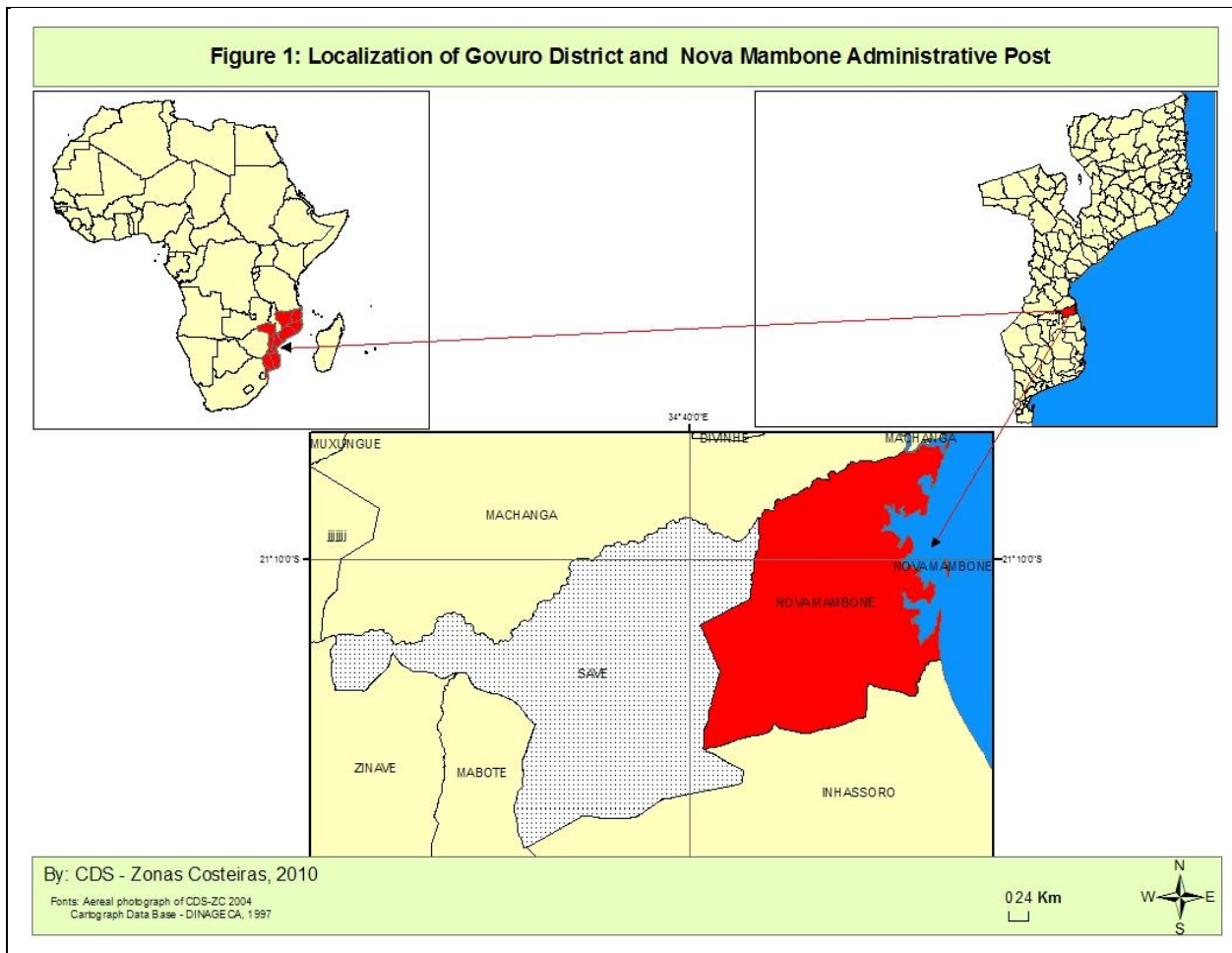
Surveys of infrastructures (schools, hospitals and water infrastructure) were carried out together with 3 local technicians and 1 field guide to visit, locate and map them using GPS. The most important strength of the method used to map the infrastructures is the fact that it was developed with the involvement of local technicians and field guide who know very well the location of the infrastructures. Their involvement in the surveys was also very useful since some areas that they forgot to map during the focus groups were recalled and included in the final version of the maps.

### 3. OVERVIEW OF THE STUDY AREA

The overall objective of this chapter is to describe the geographical, demographic, social and economic profile of the study area.

#### 3.1 - Geographical location

Geographical localization of the district and Nova Mambone Administrative Post (in red) is indicated in the **Map 1**.



**Map 1:** Geographical localization of Govuro District and Nova Mambone Administrative Post (in red)

Govuro district is administrated according to the formal structure approved by the Government of Mozambique. The district structure comprises three levels of administration, namely: district administrative posts, localities (**Table....**) and villages.

The Govuro district is divided into two Administrative Post, namely Save and Nova Mambone (**Table 1**). Nova Mambone is located in the coast of the district (**Map 1**) and is

divided into thirteen villages and each village has its own chief (“*presidente da aldeia*”), who represents the government in implementation of the official development programs.

**Table 1:** District structure in Govuro

ADMINISTRATIVE POSTS	LOCALITIES
Save	Jofane
	Luido
	Machacane
Nova Mambone	Pande
	Nova Mambone

### 3.2 - Administrative and institutional framework

#### 3.2.1 - Administrative framework

The administrative framework comprises both formal and traditional authorities organized in accordance with Mozambican legislation. The highest authority in the province is the provincial governor based in Inhambane. The governor works through the 14 district administrators. Each administrator works in direct coordination with heads of administrative posts, who are appointed by the central government. The localities are subordinated to the administrative posts. The district administration is subject to Law 8/2003 of May 19, 2003 which establishes a new regime in terms of institutional dynamics and interactions. The role and influence of traditional leadership is more visible at the locality level. The community leaders are recognized as counterparts of the heads of localities and are appointed according to the community criteria and they are upholders of the village’s traditions and social life, and traditionally the highest arbiters to whom the villagers can turn with their problems and conflicts.

Community leaders are able to decide important community issues as laid out in Decree 15/2000. Each of the administrative levels (district, administrative post and locality) works with the support of a consultative forum, which integrates formal and informal political authorities (village chiefs, traditional authorities, community police, fishing and farmer’s representatives), civil society, political leaders, businessmen, religious leaders and other influential people. The main objective of these forums is to support district government in terms of planning and implementation of priority projects at the local level<sup>1</sup>. The forums can suggest and recommend to the government the priorities for local developments as well as approve (or not approve) development initiatives.

<sup>1</sup> At district and administrative post levels these fora are called Consultative Councils (*Conselhos Consultivos*), and at locality level, is known as the Locality Forum (*Forum de Localidade*).

### 3.2.2 - The institutional representation at district level

The district government is composed by the following departments:

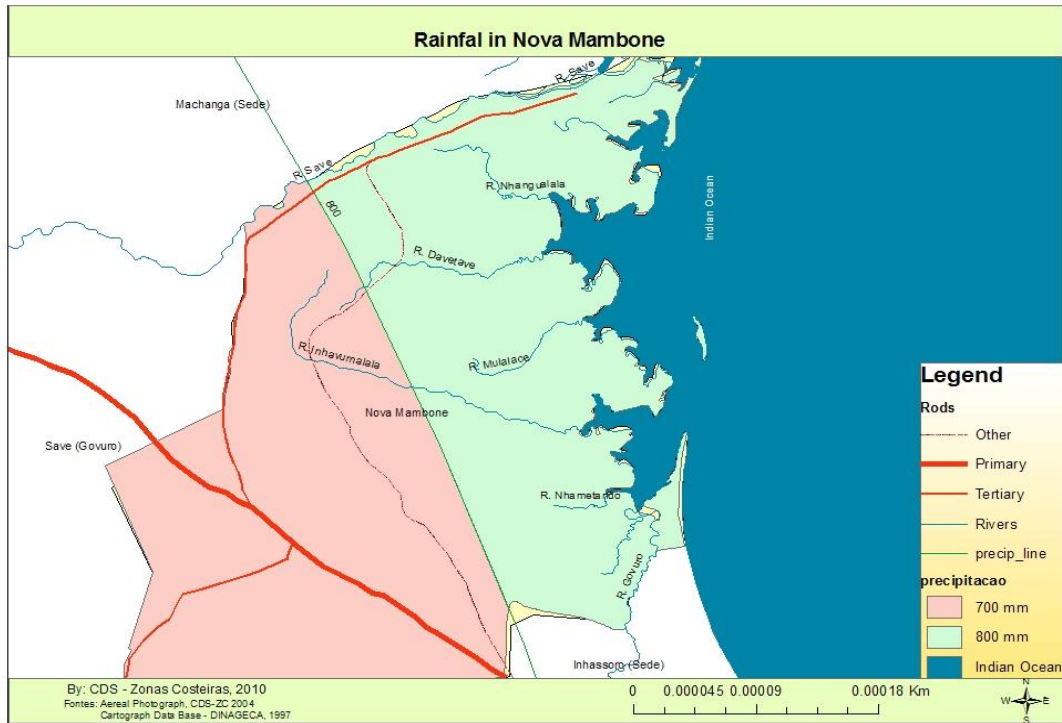
- Economic activities ( *Agriculture, Fisheries, Forests, Commerce and Industry*).
- Women, social action and health,
- Education, youth, sport, culture and technology,
- Planning and Infrastructure,
- Fiscal Directorate
- Social security and labor
- Civil Registrar
- Small Scale fisheries development extension station
- Customs
- Immigration
- Police
- Public prosecutor

This structure have been recently established under the new state law (Law of the Local State Structures – “*Lei dos Órgãos Locais do Estado*”), which gives emphasis on the role of the districts in development strategies and implementation of plans. In this approach all activities related to administration, extension and development will be implemented by the district government. However the above agencies are generally poorly represented or weak outside the district capital and thus the incidences of noncompliance of local rules (e.g. fishing, forest and other economic regulations) are common. Agriculture and fisheries are the services with more intensive extension activities.

## 4. PHYSICAL ENVIRONMENT

### 4.1 - Climate

The climate in Govuro is tropical dry type and humid, as it approaches the coast, with two seasons: hot and rainy from October to March and fresh or dry from April to September. The annual medium precipitation in the rain season (October to March) is 1500mm, with more incidence in the months of February and March, were floods occasionally occur (MAE, 2005). The precipitation increases toward the cost (**Map 2**).



**Map 2:** Rainfal in Nova Mambone

#### 4.2 - Geology and Soils

Govuro is located in the south southern region of Mozambique. This area is composed of unconsolidated Quaternary to recent sediments, mostly sand (dunes and sandy planes), but interspersed with heavier textured soils (alluviums) at the larger river mouths (Lundin et. al, 1996).

#### 4.3 - Hydrology

The main hydrological system of the Govuro district is represented by the Save river, one of the largest river in Mozambique, and its effluents which sustain an abundance of permanent water points in the floodplain as well as swampy areas and wetlands. Other important river in the district is Govuro River, with a river basin of about 11.497 km<sup>2</sup> together with Save river (AGEMA, 2006).

## 5. NATURAL RESOURCES

### *5.1 - Habitats*

Identification of habitat, and its protection and enhancement, are necessary to ensure healthy populations of plants and animals. In general, habitat identification should be focused in such a way that the entire ecosystem is protected and conserved (BNL, 2003).

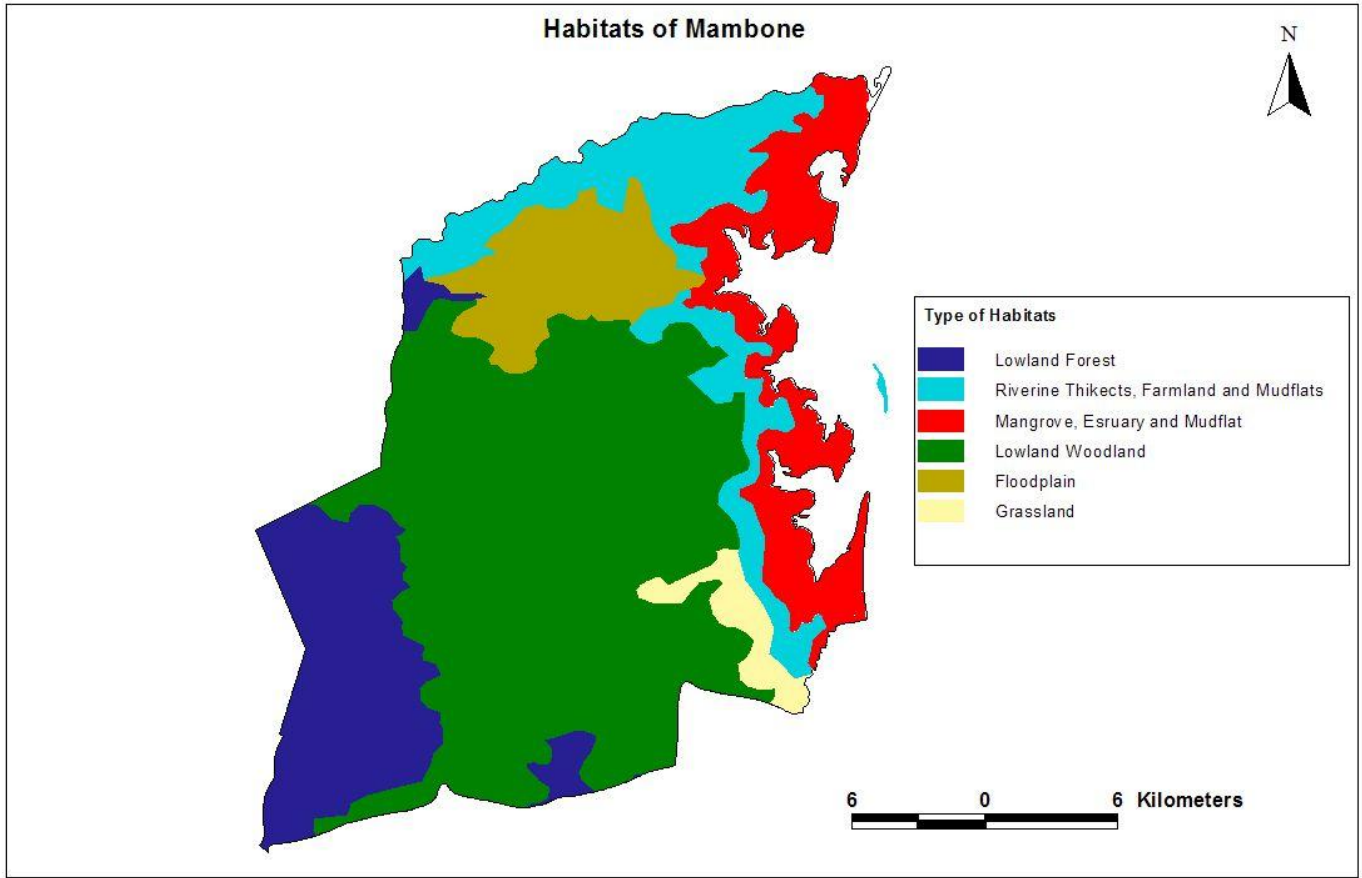
The objective of habitat mapping is to define the major natural zonation of plant communities in Nova Mambone Administrative Post. The habitat types are recognized as a mosaic of distinct plant communities, themselves a response to underlying geology and soils, drainage and relief.

The habitats act as natural units of conservation management, since each can be assessed in terms of a range of attributes, including landscape value; characteristic plant and animal species associated with each habitat, especially rare or important species; and importance to human resource use activity.

This treatment identifies the natural habitat zonation at the baseline information level. The relative importance of each habitat to conservation objectives and community resource use objectives is compared in a single tabulation on a simple 4 point scale: low, medium, high, very high. The tabulation references each assessment with key arguments and points that support the importance ranking.

Some distant types of habitats can be found in govuro (Nova Mabone): coastal marine habitats, mangrove, estuary, mad flats, floodplains, grasslands, farmlands lowland forests and riverine thickets (**Map 3**).





**Map 3:** Type of habitats in Nova Mabone

### 5.1.1 - COASTAL MARINE HABITATS

	Wildlife Key species	Botany	Importance	PRIORITY / ACTIONS
<b>Local resource use</b>	Year round fishery a key resource		VERY HIGH	Develop fisheries monitoring and assess sustainability of resource use
<b>Conservation importance and development</b>	Sea turtles Dugong Dolphins	Sea grass meadows	HIGH	Develop turtle monitoring programme  Assess status of dugong population
<b>Tourism importance and development</b>	Options for beach tourism, diving		VERY HIGH	Development of tourism facilities (small beach lodge, boats)



### 5.1.2 - MANGROVE, ESTUARY AND MAD FLATS (Map 3)

	<b>Wildlife Key species</b>	<b>Botany</b>	<b>Importance</b>	<b>PRIORITY / ACTIONS</b>
<b>Local resource use</b>	Shrimp and other fisheries major activity Shrimp fishery: particularly February to April		HIGH	Monitoring of shrimp fisheries
<b>Conservation importance and development</b>	Important marine fish nurseries Crustaceans shellfish and estuarine production system  Breeding sites for herons and egrets.  Refuge for dugong.  High production area with highly specialised suite of plant and animal species	Dominated by mangrove, <i>Avicennia sp.</i> and <i>Rhizophora sp.</i>  Critical buffering interface between marine and freshwater habitats serving to protect coastline from tidal erosion  Excellent condition of mangroves from low impact uses	HIGH	Monitoring of mangrove condition, age structure and recruitment to pick-up any trends or changes in status;  Mangrove reforestation;  Locate key resource points (nesting colonies)
<b>Tourism Importance and development</b>	Excellent potential for bird watching which can be readily integrated with existing community utilization  Sport fishing especially fly fishing		HIGH	Develop options for boating excursions for bird-watching  Discuss fishing impacts with communities



Mangrove

Estuary

Mad flats

### 5.1.3 – FLOODPLAINS, GRASSLANDS & RIVERINE THICKETS (Map 3)

	Wildlife Key species	Botany	Importance	PRIORITY / ACTIONS
<b>Local resource use</b>	Hunting area currently focused in Northern part of Nova Mambone (near Zivane National Park)	<i>Borassus</i> palms <i>Acacia</i> sp. Grasses Access to rice fields Thatching grass and palm leaf Collection of palm wine	LOW	Assess bushmeat use with relevant local communities
<b>Conservation importance and development</b>	Key grazing resource for large mammals (buffalo, elephant, sable)  Specialist habitat for reedbuck, waterbuck  Hunting zone for predators (lion, wild dog)	Open plains area dissected by drainage lines and water points surrounded by riverine thicket vegetation	VERY HIGH	Monitoring of all plains game notably predator prey species.  Investigate history, ecology and identity of common big five animals in the area
<b>Tourism Importance and development</b>	Very important for vehicle based game viewing;		VERY HIGH	Requires managed system of vehicle tracks



### LOWLAND FOREST & LOWLAND WOODLAND (Map 3)

	Wildlife Key species	Botany	Importance	PRIORITY / ACTIONS
<b>Local resource use</b>	Potentially used as hunting grounds by communities	Use of plant products (wood, log, palm leaf)	<b>HIGH</b>	Survey communities natural resource use patterns  Monitor wood extraction activities;
<b>Conservation importance and development</b>	Important refuge for large species: buffalo, elephant, leopard.  Small species: red duiker, suni,  Important <b>large mammal reservoir area</b> :  Diverse mammal and bird assemblages. Elephant, Greater Kudu, Eland, Serval, Caracal, Hunting dog  Woodland birds: Bohm’s Bee-eater, Touracos, Crowned Guinea-fowl, Raptor nesting area	Important habitat continuity providing meaningful corridor linkages to Zinave National Park.  Mixed tree species	<b>VERY HIGH</b>	Carnivore study Management focus on maintaining this habitat as a principle reservoir of natural resources used by communities  Bushbaby research  Potential for ground surveys and camera trap survey  Botanical survey
<b>Tourism Importance and development</b>	Scenically attractive and tropical – very high interest to discerning tourists, bird watchers/ wildlife / forest enthusiasts.  Also suitable for visits to see special features within context of general wildlife viewing		<b>HIGH</b>	Locate special features (hammerkop nests, pathways used regularly by leopard etc.)

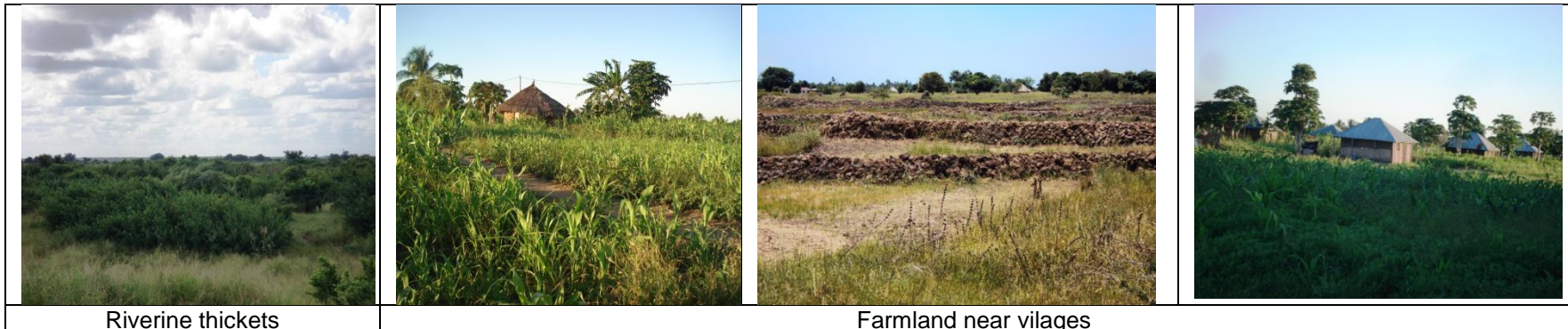


Lowlands

Woodlands

### RIVERINE THICKETS, MUDFLATS AND FARMLAND NEAR VILLAGES (Map 3)

	Wildlife Key species	Botany	Importance	PRIORITY / ACTIONS
Local resource use	.	Major natural resource collecting area  Water points, agricultural areas  Mixed habitat mosaic comprising present and former villages & associated cultivation zones	VERY HIGH	Establish defended agricultural blocks  Develop boreholes for villages  Continue resource use assessment
Conservation importance and development	Bushpig Warthog Civet	Conservation importance 'high' in the sense that development of community resource use in this area offers option to reduce human wildlife conflict in priority conservation zones	HIGH*	Botanical & zoological inventories of riverine thickets



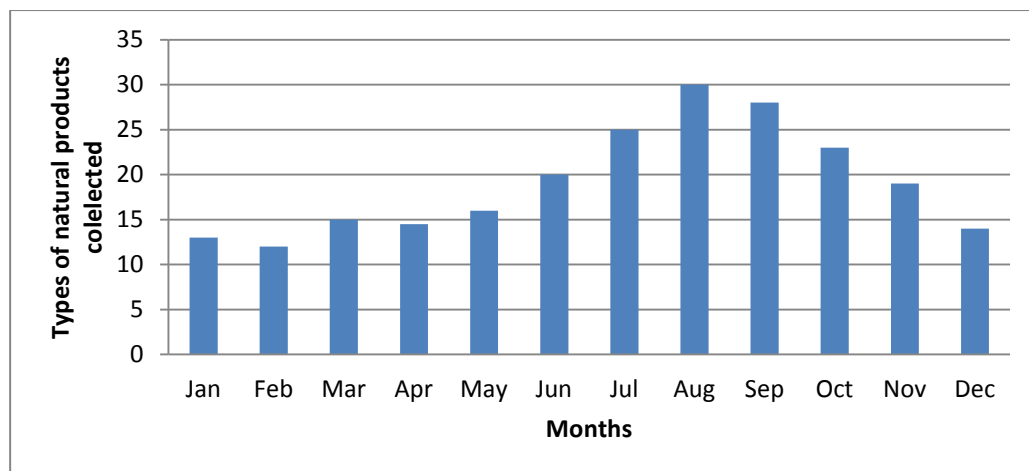
Riverine thickets

Farmland near vilages

## 5.2 - Seasonal supply of natural products

More than 30 different natural products are collected from the bush and contribute to the regular economy and life of the communities in Nova Mambone Administrative Post. These included vegetable and mineral products used in construction and nutrition, plus some additional important vegetable products, mainly woods (boat construction, firewood, musical instruments) and also dyes.

The overall seasonal pattern of natural product collection shows marked variation with the number of products being collected in peaking in the period June-October, the height of the dry period after the main plant growth season (**Fig 1**).



**Figura 1:** Seasonal changes in number of different natural products collected from natural habitats

Inspection of seasonal collecting activity by category indicates that much of the apparent seasonal pattern can be attributed to collection of specialist plant products used in building, mainly creepers and palm leaves in the dry period June to September.

Collection of vegetable products in the dry season imply a potential interaction between community needs to move into the bush to exploit this resource in the same period that wildlife viewing opportunities will be at their best.

Natural resources of very high importance collected throughout the year include fisheries and freshwater supply.

### 5.3 - Useful plant species assessment

Local communities harvest a large selection of wild plants from their surrounding environment. Some of these, along with their uses, include:

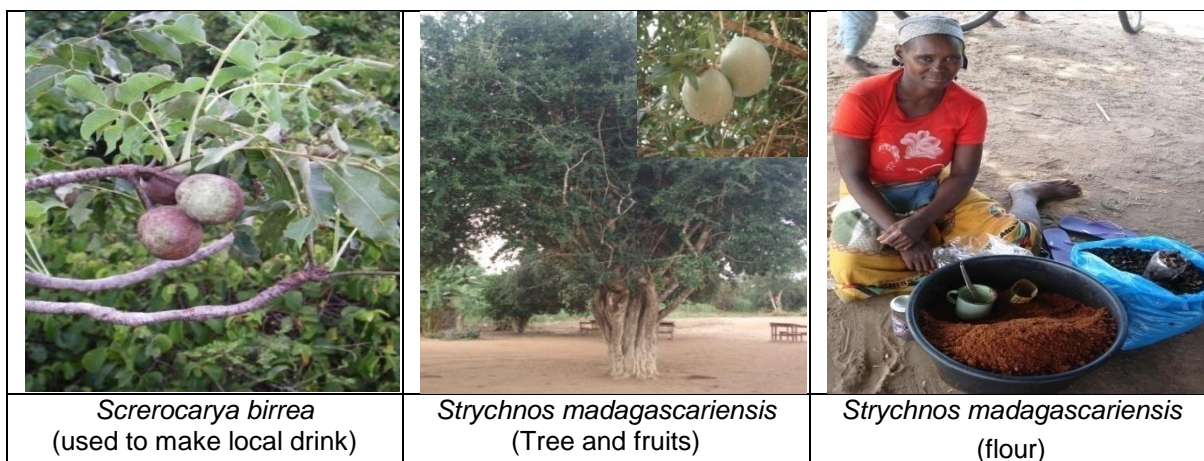
- ☞ Wild fruits, e.g. *Sclerocarya caffra*, *Parinari curatellifolia* and *Vangueria infausta*;
- ☞ Wood: firewood, construction, carpentry, tool making;
- ☞ Coconut palm leaves: thatching of roofs;
- ☞ Bark (especially *Brachystegia* and *Julbernardia* spp): string, rope and beehives;
- ☞ Medicinal plants;
- ☞ Gum from *Hymenaea verrucosa*;
- ☞ Sap of *Hyphaene* palms: palm wine.

#### 5.3.1- Wild foods

Wild food comprises an important part of the diet of families living in Nova Mambone, particularly during dry season. The most commonly collected fruit for food is massala ou cuacua (*Strychnos madagascariensis*). Another important food is the seed of the Marula (*Sclerocarya birrea*) (**Figure 2**). In the table....are presented de commonly collected wild food.

**Table 2.** Commonly collected wild food

Plant name (local and scientific names)	Edible part
Cuacua ( <i>Strychnos madagascariensis</i> )	Fruit
Mwambo ( <i>Manikara mochisia</i> )	Fruit
N'khany ( <i>Sclerocarya birrea</i> )	Seeds, Fruit
Psimba ( <i>Rinorea angustifolia?</i> )	Fruit
M'hanga ( <i>Palmeira</i> sp)	Fruit
Matila ( <i>Artabotrys brachypetalus?</i> )	Fruit
Chucutsu ( <i>Boscia</i> sp?)	Roots



**Figure 2:** Some of the most used plants in Nova Mambone

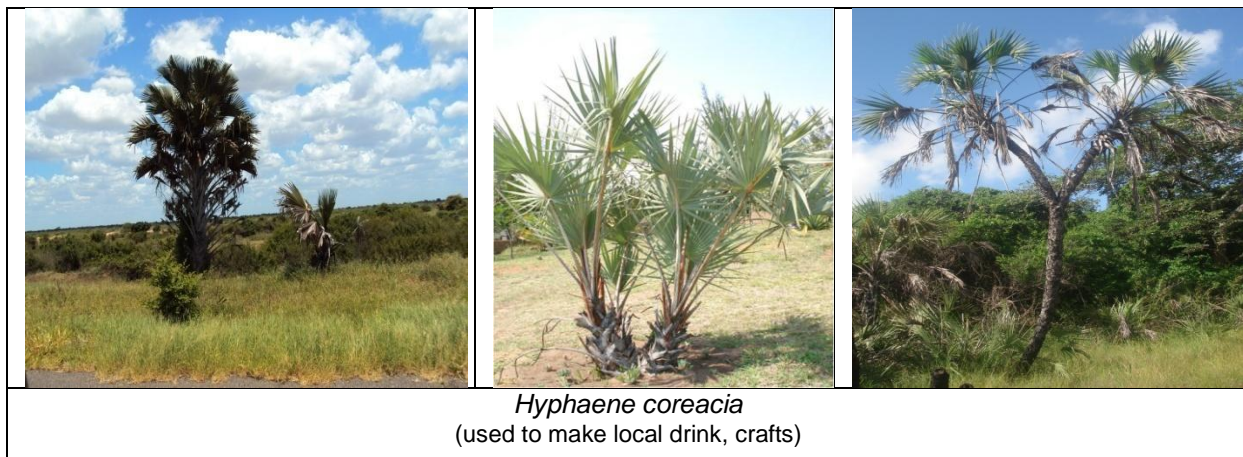


### 5.3.2- Local Drinks

The local palm wine (uchema), is a vital part of the area`s economy. The plant grows along the save river and is also more frequent in floodplains and grasslands (**Figure 3**). According to the consultations, many households produce palm wine regularly in large quantities.

Merchants regularly come to Nova Mambone from other districts to buy palm wine. Other drinks (spirits) are produced locally from fruits of many plants. Spirits have a high price per litre than the local palm wine, although produced only seasonally.

Given the large quantities consumed, the social costs of alcoholism and associated health costs might be explored. Further, the extent of the damage to habitats associated with uncontrolled fires for palm wine production is not known.



**Figure 3:** Palm used to make local drink (uchema)

### 5.3.3- Construction and crafts

Plants and trees also are collected for construction and craft making. Families harvest them for making poles, mats, pestles, household utensils, fishing traps, sieves, and constructing their houses. Although these activities are important to families living in Nova Mambone, they contribute to deforestation and destruction of the habitats.

The most commonly used species for construction are the lebombo ironwood (*Androstachys johnsonii*), Mopane (*Colophosphermum mopane*) and Acacia (*Brachystegia torrei*). The Pod Mahogany (*Afzelia quanzensis*), a valuable commercial timber, was reportedly used by some households.

According to the consultations, some respondents said they used to sell craft or construction products. The most commonly sold products are mats, sieves and baskets.

More than 90% of household consulted use grass and poles for constructing their houses. The average family has 2 or 3 houses. If each house uses between 25 and 40 bundles of

grass, with a replacement time of 10 years, than 5000 and 8000 bundles of grass per year would be needed for houses construction. Using a similar approach, it is estimated that from 1400 to 2000 poles are used for house construction per year (adapted from Hall, 2000)

Plants used for construction tend to be collected infrequently-often just once per year- and to be farther away. According to the respondents, plants used for construction are far away.

### 5.3.4- Firewood and Charcoal

Households collect branches from a variety of trees for use in cooking, production of local spirits, lightning and heating. The most common choice for firewood are the Cuacua (*Strychnos madagascariensis*), Marula (*Sclerocarya birrea*) and Acacia (*Brachystegia torrei*). Charcoal is also produced in Nova Mambone and the most common used species are in the table bellow.

**Table 3.** Some plants used for firewood and charcoal

Commercial name	Scientific name	Classification
Pau-preto	<i>Dalbergia melanoxylon</i>	1 <sup>st</sup> class
Tamarindo	<i>Tamarindus indica</i>	4 <sup>th</sup> class
	<i>Lanea sp</i>	4 <sup>th</sup> class
	<i>Lonchocarpus bussei</i>	No classification
	<i>Pterocarpus rotundisilius</i>	No classification
Messassa	<i>Brachystegia sp</i>	2 <sup>nd</sup> class
Messassa encarnada	<i>Julbernadia globiflora</i>	2 <sup>nd</sup> class
Jambire	<i>Millettia sthlmannii</i>	1 <sup>st</sup> class
	<i>Pseudolachnostylis maproneifolia</i>	3 <sup>rd</sup> class

Collection of firewood and charcoal is for subsistence use and cell and it contributes to deforestation at least to some degree. Overall, more than 80% of household in Nova Mambone said they collected firewood in the nearby surroundings with little variation by community.

The average household collects about 2 kg of firewood per person per day. Taking in account that a household is composed by five members, this is equivalent to 3650Kg of firewood per year. Although this appear consistent with other studies (William 1993, Hall 2000), it is a rough estimate based on a small number of cases for which quantities were reported. Households in Pande locality appear to collect slightly more firewood and charcoal on average than other households in Nova Mambone, which may in part be attributed to the selling and production of local spirits.

### 5.3.5- Medical Plants

Local communities rely heavily on medical plants to treat illnesses. More than 20 plant species are collected for medical purposes in Nova Mambone. The most commonly collected plants are presented below:

**Table 4.** Some plants used for medical purposes

Local Name	Scientific Name	Part(s) used
Matita	<i>Artabotrys brachypetalus?</i>	Roots, leaves
N'khany	<i>Sclerocarya birrea</i>	Bark
Cuacua	<i>Strychnos madagascariensis</i>	Roots, leaves
Psimba	<i>Rinorea angustifolia?</i>	Roots
Chanatse	<i>Colophosphernum mopane</i>	Bark
Mwambo	<i>Manikara mochisia</i>	Roots
Simbiri	<i>Androstaschys johnsonii</i>	Roots

Nova Mambone village appeared to be the least reliant on medicinal plants, which may be due to the presence of health centre, distance to medical plants, or possibly a lack of traditional local knowledge about treatment.

Usually, when a member becomes ill, families first rely on their own knowledge of medical plants to treat the illness and only go to traditional healer “curandeiro” if the illness persists. The most common illness treated by traditional healer include stomach and intestinal problems, vomiting, diarrhoea, impotency, muscle and bone aches, headaches and others (CARE, 1995).

### 5.4- Wildlife Species Assessment

Wildlife diversity was confirmed to be high, with a total of 46 mammal species (**Table 5**), being identified as occurring in Pande locality (Mark Wood Consultants and Impacto 2002).

These included endangered species such as elephants. The antelopes found regularly in Nova Mambone were identified as reedbuck and kudu. Traditions, uses and beliefs associated with some wildlife species were also discussed (**Table 6**), although the issue of hunting needs to be further studied.

The most commonly hunted animals are grey duiker, impala and wild pig. Animals are caught using wire snares, which are set and shacked periodically or less often, bow and arrow.

Reports by the community indicate that even the current level of hunting may be unsustainable and the number of animals is declining. These reports merit further inquiry. Better estimates of animal population are needed as well as the level of hunting that is occurring.

**Table 5.** Some mammals in Govuro District

Portuguese name	English name	Scientific name
Búfalo	Buffalo	<i>Syncerus caffer</i>
Changane	Suni	<i>Neotragus moschatus</i>
Lebre	Scrub Hare	<i>Lepus saxatilis</i>
Porco espinho	Porcupine	<i>Hystrix africae australis</i>
Cabrito cinzeto	Bush Duiker	<i>Sylvicapra grimmia</i>
Porco Bravo	Bushpig	<i>Potamochoerus porcus</i>
Oribi	Oribi	<i>Ourebia ouribi</i>
Elefante	Elephant	<i>Loxodonta africana</i>
Chango	Reedbuck	<i>Redunca arundinum</i>
Facocero	Warthog	<i>Phacochoerus aethiopicus</i>
Cudo	Kudu	<i>Tragelaphus strepsiceros</i>
Impala	Impala	<i>Aepyceros melampus</i>
Elande	Eland	<i>Taurotragus oryx</i>
Imbabala	Bushbuck	<i>Tragelaphus scriptus</i>

#### 5.4.1 - Traditions, uses and beliefs

Ten species were mentioned in discussion about uses and beliefs about wildlife. Small antelopes, particularly suni, are used for meat, while carnivorous species attract attention for use in local medicinal and other belief systems.

**Table 6.** Traditions, uses and beliefs associated with some wildlife species

Species	Use
Python	Medicine - fat and bones used for throat illnesses
Bushbuck	Meat and drum skins
Common duiker	Medicine - fit bracelet of skin on arm and leg to aid 'fits'.
Hyena	Medicine - tail used by traditional healer "curandeiro" in religious ceremonies and initiations
Lion	Medicine - use fat for burns, ear problems. Skin used by traditional healer "curandeiro"
Leopard	Medicine - skin used by traditional healer "curandeiro"
Species	Beliefs
Red duiker	When walking through the bush the passage of two red duikers in succession across your path is an indicator of bad luck or bad news.
Chameleon	The sighting of a chameleon was cited by one <i>household</i> as an indicator of good luck. Though not clear that all were unanimous about this!
Yellow baboon	Various superstitious beliefs expressed – e.g that encountering a dead baboon may predict a forthcoming death to you or a member of your family.
Pangolin	Associated with a number of cultural beliefs – example cited by the households is the belief that at the commencement of rains it is customary to capture a pangolin and place it within a circle of people. Its subsequent movements can be used to predict expected productivity of the growing season.

It is probable that more detailed species by species exploration of these topics would reveal a wealth of additional detail and species.

These results reflect only the response to a relatively superficial discussion, so perhaps reflect some of the more immediate and prevalent ideas.

## 6. SOCIO-ECONOMIC CONTEXT

This section provides an outline of the socio-economic context, by providing a very brief overview of key socio-economic characteristics of Inhambane Province, Govuro District and Nova Mambone Administrative Post in particular, with detailed descriptions provided on the agriculture, and artisanal fishing sectors, as these are the main activities and are most likely to be affected climate change.

### 6.1 - Population

In 2007 (National Population and Habitation Census, national statistics Institute, 2007), the population of Inhambane was estimated at 1.25 million of which 56% are women. Based on the census data 45% of the population are in the 0 to 14 years age group while 88% are in the 15 to 59 years age group. The average members per household is 4 and the growth rate is 1 (Table 7).

**Table 7.** General demographic profile of Inhambane Province (2007)

Indicator	Number	%
Total population	1.252.479	
Man	556.548	44,4
Woman	695.931	55,6
Population with age of 0 to 14 years	566.206	45,2
Population with age of 15 to 59 years	586.595	46,8
Population over 59 years	99.679	7,9
Population density (hab/km <sup>2</sup> )	18,6	
Growth rate		1,1
Number of member per household	4,4	

According to the last Census (2007), the total population for Govuro was estimated at 34.494 people, with 40% of the population being less than 14 years old. More than 75% of the population of the Govuro district live in Nova Mambone. The population of Govuro belongs to the Matsuas and Ndaus generic groups so Xiswa and Ndaus are their languages.

## 6.2 - Infrastructures

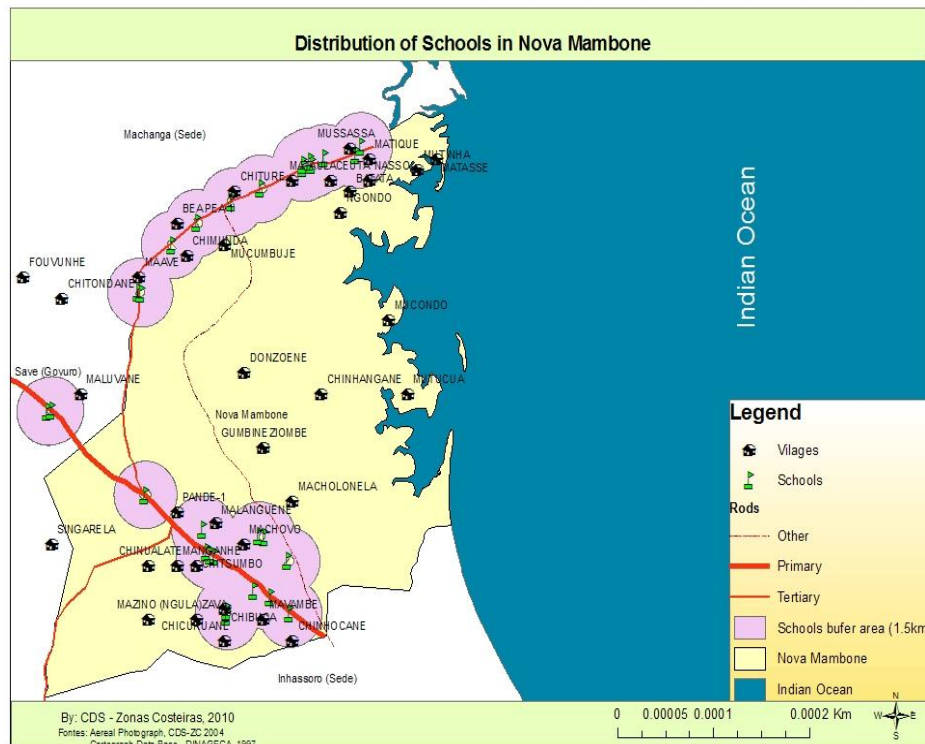
### 6.2 .1 – Education

The number of schools have been increasing in the last five years (**Table 8**). In the entire district there are 26 schools, in which 18 are primary schools (grade 1-5), 7 are complete primary schools (grade 1-7) and 1 secondary school (**Table 8**), with a total of 9.797 pupils.

**Table 8.** Schools of Govuro in the last five years

Escolas/ano	2005	2006	2007	2008	2009
EP1´s	19	18	19	20	18
EPC´s	3	4	4	4	7
ESG1	1	1	1	1	1
S.TOTAL	23	23	24	25	26
AEA	37	35	31	70	74

In Nova Mambone the schools are not equally distributed, many schools are concentrated in the main village and along the main road in the North and South of the district. In the Central region there are no Schools (**Map 4**), which means that a lot of children walk more than 2.5 km to reach a school (se the 2,5 buffer zone in the **map 4**).

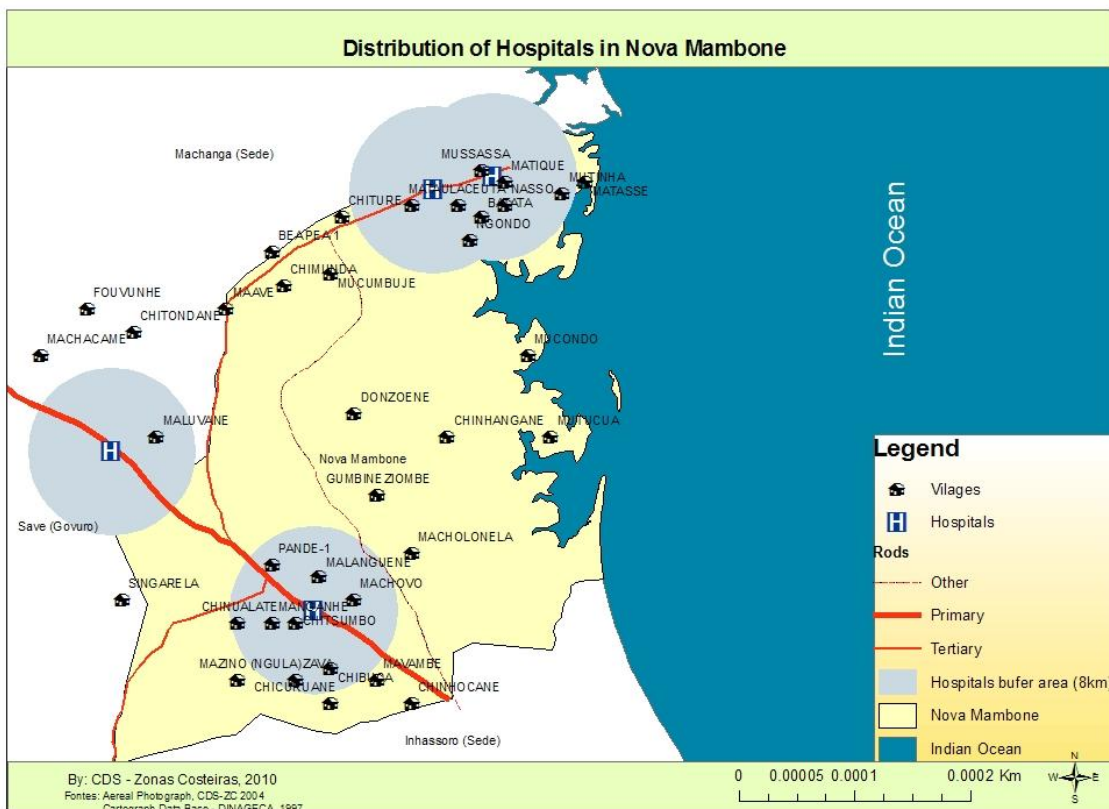


**Map 4:** Distribution of schools in Nova Mambone

## 6.2 .2 – Health

There are 7 health centres in Govuro, 4 located in Nova Mambone (**Map 5**) and this is not enough to meet the needs of the local population. According to the Ministry Council Decree n°. 127/2002 concerning to the Health National System, in rural areas a health centre should cover a buffer zone of 8 Km. A total of 17 villages in Nova Mabone are within 8 Km from a health centre (**Map 5**) representing 51,5%. Doane health centre (**Figure 4**) is the largest in the district.

The situation of health in the communities is still precarious; many villages are far away from health centres (**Map 5**), there are no enough technicians (only one doctor in the district) and the medicines are both short in supply and of inferior quality. The most frequent diseases are: malaria, HIV/AIDS, pneumonia, diarrheas, tuberculosis, anaemia and others.



**Map 5:** Distributions of health centres in Nova Mambone



**Figure 4.** Doane health Centre – Govuro District

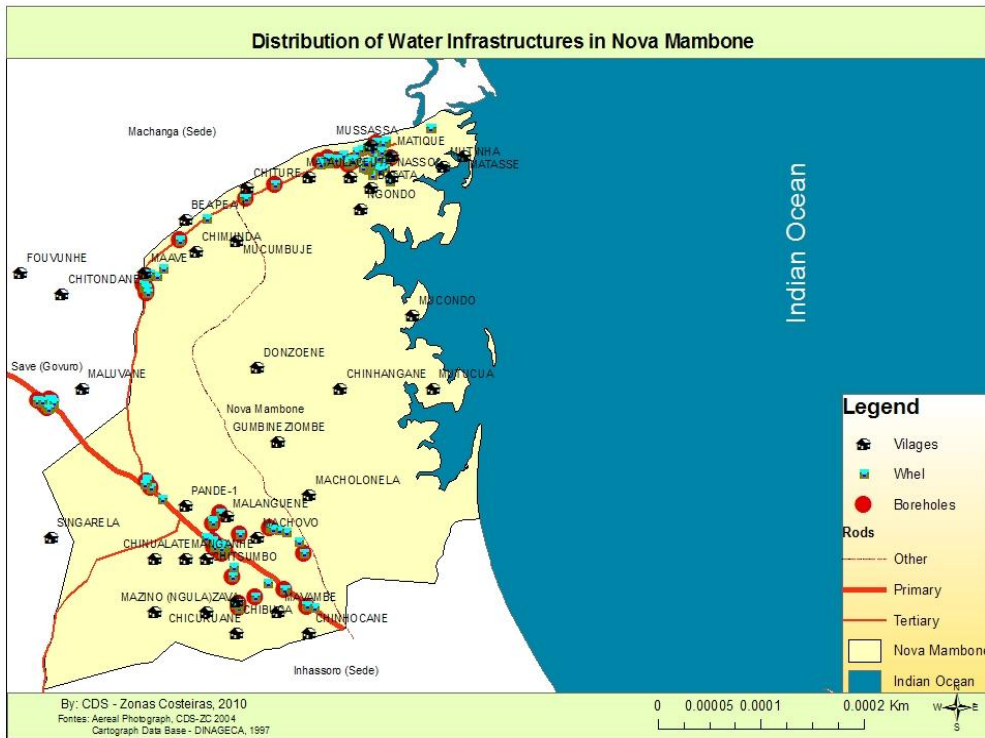
### 6.2 .3 – Water

In Govuro district there are 164 wells, 241 manual boreholes, 11 electrical boreholes, 8 community cisterns and 25 individual cisterns (**Figure 5**), and the majority of them are not operational. In Nova Mambone the water supply is still a problem to many communities because the borehole are not equally distributed, there are concentrated in the North and South all along the main road (**Map 6**). Many communities in the central region of Nova Mambone have no boreholes (**Map 6**) and some of them are forced to walk 10 to 20 Km to the nearest borehole.



**Figure 4.** Water infrastructure in Govuro





Map 6. Distribution of water infrastructure in Nova Mabone

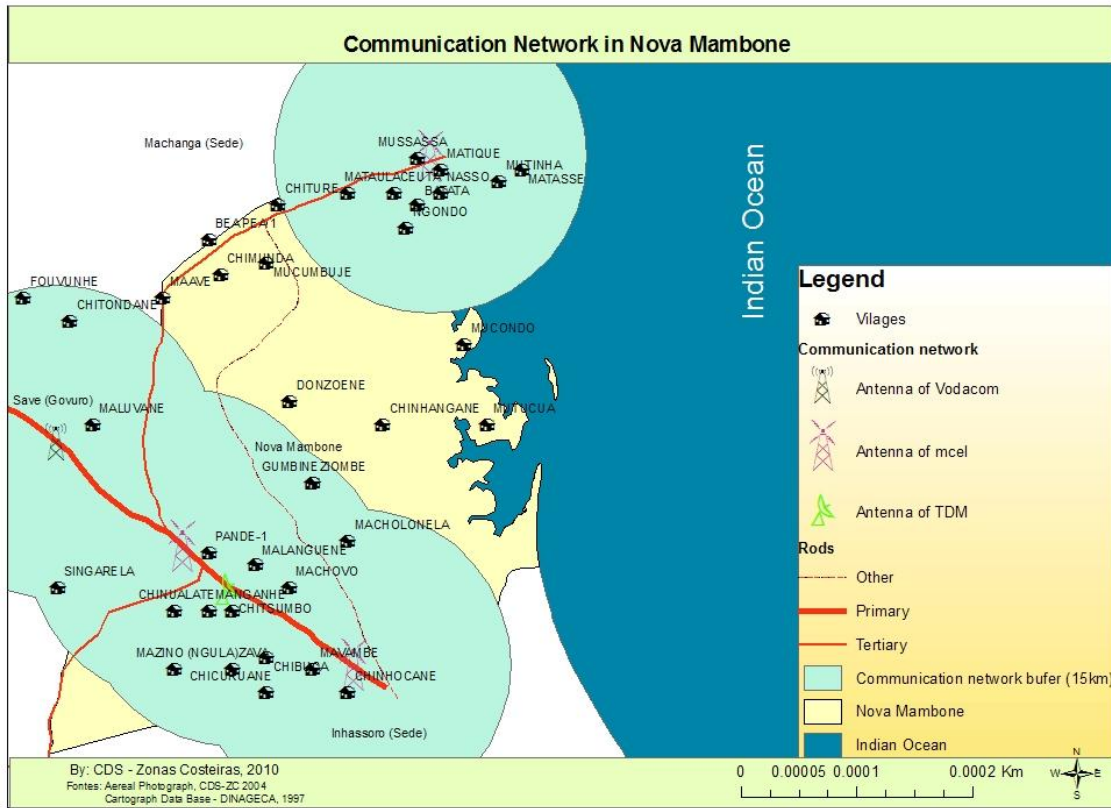
6.2 .4 – Transport and Communications

Govuro district has road connection with the main points of the South and Centre of the country through the National Highway EN1 (Figure 5). There are regular transports to and from Govuro.

The communication in the district is trough mobile phone (mcel and vodacom, Figure 5..), which cover large areas, mainly in the north and south of Nova Mambone (Map 7).



Figure 5. Transport and communication infrastructures



**Map 7.**Communication network in Nova Mambone

### *6.3 - Economic Activities*

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The majority of the population in the study area is involved in agriculture, fishing and livestock rearing as key economic activities.

Like in other parts of the country, there is a gender-specific division of labour, assigning certain activities and areas of work to women and men. The men perform heavy labour in the fields, doing other manual work. House work which includes collecting fuel wood and fetching water, and children care are the tasks of women. In addition there are highly integrated into the rural production structures. They are responsible for certain jobs in connection with growing crops on the family plot, such as hoeing, sowing, weeding and transporting the harvest.

#### 6.3.1 - Agriculture and cattle farming

Agriculture is the largest of these sectors, and of specific importance in areas further removed from the coast. There are two key food and income generation systems in Govuro district:

The first is composed of dry land farming systems mainly located inland from the study area, and comprises a combination of crop production, livestock rearing and trading. Rain-fed crop production is susceptible to climatic variability and exposed to risks of floods and prolonged dry seasons. The access to potential markets is poor and in some areas commercial transactions do not involve money.

The second system is practiced in the lowland and coastal areas located along the coast and major rivers, such as the Save River. This system consists of a combination of fishing, crop production, and livestock rearing and trading, with fishing being the most important.

Agriculture takes place normally between November and April. Crops include maize, sorghum, millet, cassava, beans, groundnut, rice, sweet potatoes and horticulture (**Table 9 and Figure 6**). In General there is an increase in total production in the last five years (2005 to 2009). When possible, two cycles of crops are planted per season. Cultivated areas are situated near villages and near water sources such as rivers, swamps, and lakes.



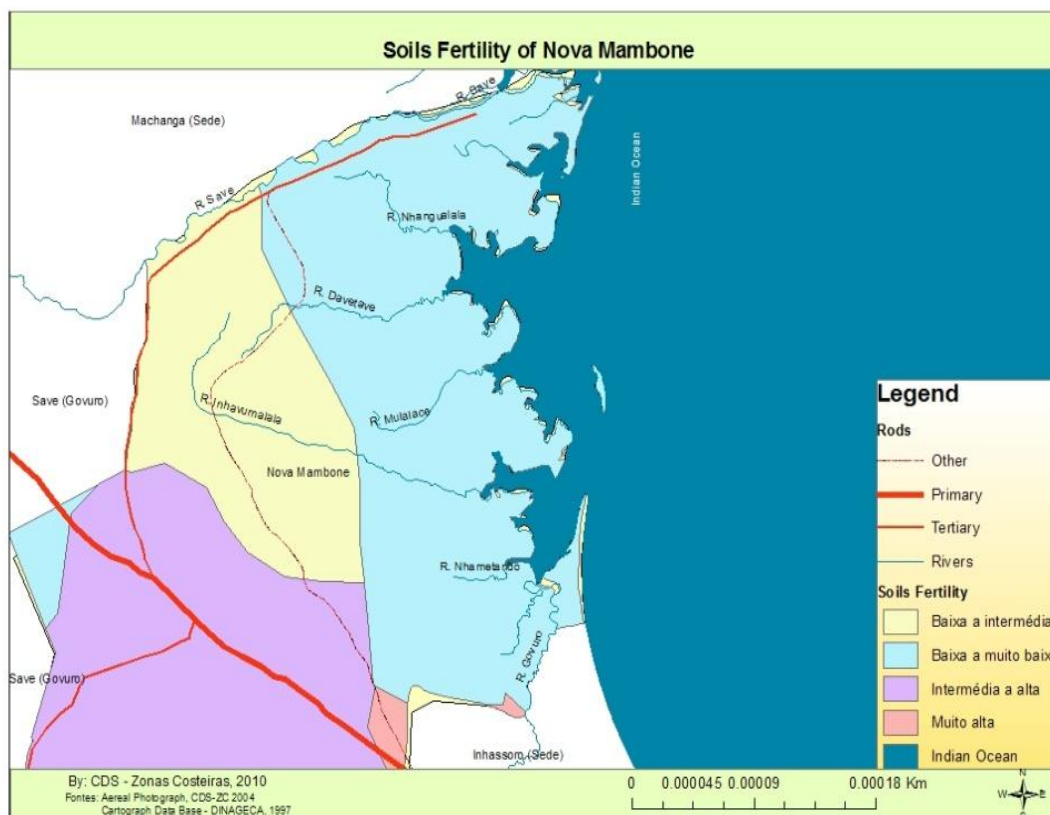
**Figure 6:** Some crops grown in Govuro

**Tabela 9:** Total production in Govuro district from 2004 to 2009

Crops	2004/2005 ( Tons)	2005/2006 ( Tons)	2006/2007 ( Tons)	2007/2008 ( Tons)	2008/2009 ( Tons)
Maize	405	2469	2264	3285	8331
Sorghum	1323	2369	2337	2506	3128
Millet	600	640	426	440	1992
Cassava	1287	1161	963	1236	6605
Beans	11	167	143	102	420
Groundnut	20	139	107	217	226
Rice	96	15	60	71	208
Sweet potatoes	196	218	53	270	337
Horticulture	60	68	85	141	1640
<b>Total</b>	<b>4.058</b>	<b>7.246</b>	<b>6438</b>	<b>8268</b>	<b>23.000</b>

The level of mechanization is almost nil and as a rule, fields are worked using traditional tools like hoe. During the dry season the villages engage in various income-generating activities such as weaving baskets and mats, growing vegetables, production of local wine (*uchema*), etc.

The agricultural potential varies within Nova Mambone. The gradient of the fertility decreases towards the coastal area (**Map 8**), because being a close area to the ocean, the salinity affects drastically the soils fertility. In a general, the soils of Nova Mambone are relatively poor for agriculture due to the influence of the sea. There are some areas located in the inland, away from the Save river margins, in the flood plain which has relatively high fertility, good for agriculture. Details on Soil suitability for each crop are presented in the **annex I**.



**Map 8.** Soil fertility in Nova Mambone Administrative Post

There was a significant increase of livestock, especially cattle in 2009, from 7253 to 8415 cattle (**Table 10**). According to the Department of Economic Activities in Govuro, this was due to the guaranteed technical assistance and associated with the abundance of good quality pasture.

**Table 10.** Type of livestock in Govuro

year	Species				
	Cattle	Goats	Gallinaceous	Sheep	Pigs
2005	7.088	9.025	9.368	254	189
2006	7.208	9.760	9.903	269	201
2007	7.088	16.822	16.863	314	329
2008	7253	19.979	17.613	341	409
2009	8.415	26.493	22.497	285	492

There are many owners of cattle in the District. Some households have sheep, goats, pigs, etc. Most also possess chicken and other poultry. They are kept to provide family’s own needs and can also be sold at the local market, or presented as gifts to the visitors.

Cattle farming (**Figure 7**) provide an alternative in the worst hunger periods and it also constitutes a financial reserve in case of emergency. For the villagers, cattle is considered a heritage to be conserved from generation to generation.



**Figure 7.** Some livestock in Govuro

### 6.3.2 - Fishing

Fish is the second largest single export from Mozambique after aluminium, and accounts for 10% to 15% of all exports. It constitutes approximately 1.5% of Gross Domestic Products (GDP). According to World Bank estimates, income from natural resources in Mozambique will increase annually from "...US\$30 million to US\$67 million until the year of 2015 if development and fiscal policies are effectively implemented." (World Bank: 2005).

Fishing activities in Mozambique can be classified into three categories:

- ⇒ Artesanal fishing by communities along the coast and around inland water bodies. Catches are used for both subsistence and sale.
- ⇒ Semi-industrial fishing by intermediate size boats, mainly involved in shallow water shrimp fisheries offshore and Kapenta fisheries on Cahora Bassa Dam. Catches are used for both local consumption and export.
- ⇒ Industrial fishing with larger vessels fishing for shallow water shrimp and fish species in deeper waters. Catches are used mainly for export.

Artesanal fishers yield in the order of 70,000 tons of fish per year, while semi-industrial and industrial fleets yield approximately 11,500 tons and 10,000 tons, respectively (NORAD, 1999).

Fishing is one of the main economic activity in Govuro, and it is practiced in the open sea and in the Save river estuary. There are two main type of fishing gear used: hand line fishing practiced by semi-industrial and artesanal boats (with or without motor) and beach seine fishing. The beach seine fishing (**Figure 8.a**) is practiced mainly in the coast and the hand line fishing is practiced mainly in the open sea.

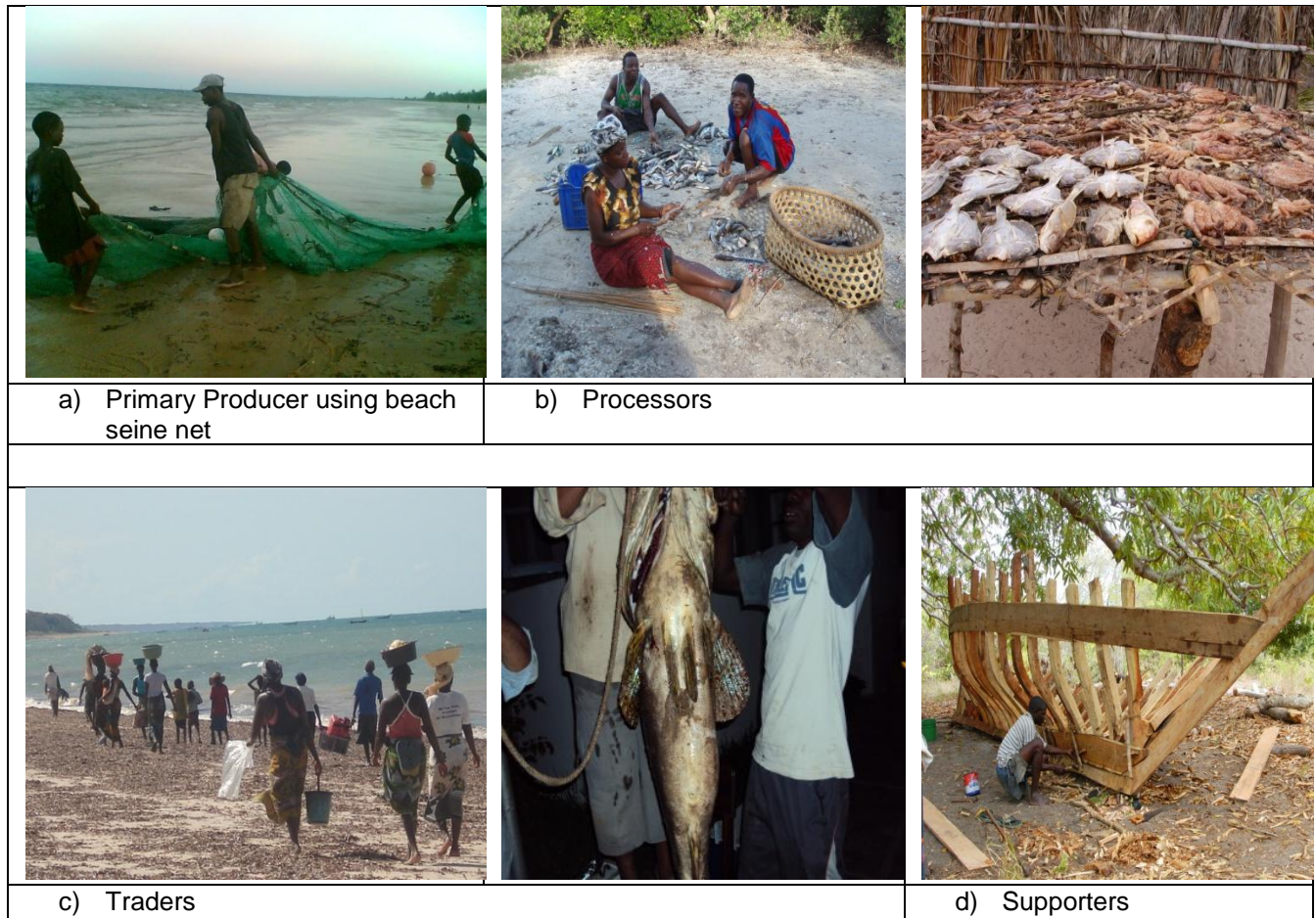
Total fishery productivity has been decreasing in the last five years, except the year 2008, (**Table 11**). Although shrimp are not the main product by volume, their high value makes them the most important product of Mozambican fishery sector.

**Table 11:** Fishery productivity in the last five years in Govuro

ANO	2005 Tons	2006 Tons	2007 Tons	2008 Tons	2009 Tons
Shrimp	71	61	50	79.7	84
Dry fish	491	486	269	895	490
Fresh fish	7	7	40	55	61
Mud crab	512	402	303	412.1	390
<b>Total</b>	1.081	956	662	1.441,8	1.025

The overall chain of artisanal fishing activity consists into four groups (**Figure 8**):

- ☞ The primary producers fishers (those who capture and sell fresh or processed fish) , and collectors, the latter mainly women;
- ☞ Processors (Those who preserve fish by sun drying, smoked or put in brine and dried.
- ☞ Traders (Those who cell fish) and
- ☞ Fishing supporters (*gear and boat builders and input suppliers*).



**Figure 8.** Overall chain of artisanal fishing activity

The Save river as well as the floodplain associated areas, have a great diversity of fish. Species like *Tilapia rendalli*, *Oreochromis mossambicus*, *Clarias gariepinus*, *Oreochromis placidus*, *Ctenopoma multispine* and *Pegalops cyprinoides* were registered in the Save river and some swamps (Sasol, 2006). The Moçambican tilapia is abundant and it constitutes a great subsistence source and proteins for the local communities (**Figure 9**)





**Figure 9.** The Moçambican tilapia

### 6.3.2.1 - Fisheries management and institutional issues

Arrangements for the co-management of fisheries have been introduced in coordination with the Provincial Department of Fisheries, Maritime Administration, and the National Institute of Small Scale Fisheries Development (IDPPE). This implies community and local authority involvement in fisheries and the management of other natural resources.

These co-management arrangements have been introduced based on the concepts outlined in the *Master Plan for the Fisheries Sector* (MPFS). According to this Plan, the fisheries co-management arrangements are headed by the National Fisheries Administration Commission (NFAC), and implemented at provincial level by the Provincial Co-management Committee (PCC), chaired by the Provincial Directorate of Fisheries. The Fisheries Community Councils (FCC) form the main fisheries social mobilization bodies at community level towards the co-management of fisheries resources. The FCCs are composed of community leaders, fishers using different types of fishing gear, women, and youth residing in fishing villages. The objective of each of these committees is to contribute towards the efficient management of the fishing resources in their respective areas of jurisdiction by, *inter alia*, mobilizing and sensitizing fishers about the need to use fishing material and equipment that enable sustainable use of coastal marine resources.

There is a fishermen association, with more than 20 years of existence designated by APEGO (Associação dos Pescadores de Govuro “Association of the Fishermen of Govuro”), which usually do fishing and processing through sun drying and salting and drying to be sold in the inland areas. The main market for the dry fish is the Beira and Chimoio cities, and it is also exported to Zimbabwe.

The licensing of fisheries is administered by the Provincial Department of Fisheries. It is responsible for the control of the fisheries sector, in collaboration with the Maritime Administration. However, these agencies are poorly represented outside the provincial capital, and incidences of illegal fishing are, therefore, common.

### 6.3.3 - Hunting

In the coastal areas, local communities are mainly fishers but every village seem to have people who use bows and arrows, or nets, to hunt antelope, small mammals and birds for meat.

Hunting is an activity practised by Pande community located far from the sea. The hunting is done in the buffer zone or even inside of Zinave National Park. All residents are aware that hunting is prohibited. Through informal conversation, we learned that many families depend on game meat for their subsistence (**Figure 10**), but all survey respondents denied hunting, apparently for fear of incrimination.



**Figure 10:** Sale of game animals in Pande locality

Prior to modern hunting laws the traditional hunting method was for small bands of 4-5 hunters to go to the bush for a co-ordinated hunting effort, with results to be shared among the larger community on return. Now this system is illegal the practical result is that an organized public system being replaced by a situation in which individuals may act independently to hunt discreetly according to personal needs.

The most commonly hunted animals are Bush Duiker (*Sylvicapra grimmia*), impala (*Aepyceros melampus*), Kudu (*Tragelaphus strepsiceros*), Bushpig (*Potamochoerus porcus*), Warthog (*Phacochoerus aethiopicus*) and Porcupine (*Hystrix africaeaustralis*). Animals are caught using wire snares, which are set and shacked periodically or less often, bow and arrow. Hunting is likely to have cultural or non-use values in addition to direct use values of meat consumption. At least in the past, hunts were preceded by traditional ceremonies among men.

The hunt product is usually sold at local market in Pande locality, along the National highway 1. The prices vary from 120 MT to 150 MT for Bush Duiker and Reedbuck, 500 to 1,000 MT wilpigs. In the days of good captures the hunters can sell more than 100 animals of several species.

Reports by the community indicate that even the current level of hunting may be unsustainable and the number of animals is declining. These reports merit further inquiry. Better estimates of animal population are needed as well as the level of hunting that is occurring.

#### 6.3.4 - Tourism

The Mozambican civil war had an extremely detrimental effect on the tourism industry in the country. In the almost sixteen years since the end of the civil war, a lot of work has been done in order to revive and re-establish the industry. It is, therefore, important to understand the context within which tourism in Mozambique finds itself at present (ACER, 2007).

The tourism activity is almost nil in Nova Mambone, probably due to the lack of basic infrastructures for this activity like lodges, hotels, restaurants, and road access to beaches.

The southern coastal area of Nova Mambone, presents good potentialities for the development of tourism, there are sandy beaches, the dunes present vegetation still intact.

## 7. SUMMARY OF MAIN PROBLEMS

- ☞ Indiscriminate exploitation of natural resources: caused by poverty and high cost of living. Natural resources are exploited at a higher rate than their natural renewal;
- ☞ Increasing consumption of firewood and charcoal: This puts pressure on the forest resources of the district;
- ☞ Mangrove Cutting: Mangrove cutting for building material occurs frequently in Govuro, mainly in Nova Mambone Administrative Post. The principal cause for the problem is lack of control over mangrove cutting.
- ☞ Absence of an open-sea fishing sector: Due to a lack of means to enable fishing in the open sea, the marine resources of the bay-side are being over-exploited;
- ☞ Non-licensed and uncontrolled fishing: some fishers are not licensed for fishing activity and the use of inappropriate fishing practices (e.g. use of poison, shark fishing net). These practices affect the stocks of some species of great economic value. They also threaten the survival of some endangered species such as marine turtles and marine mammals (dugong and dolphins).
- ☞ Search for more agricultural land: This leads to deforestation and a reduced layer of vegetation;
- ☞ Soil erosion and loss of nutrients: Due to the practice of slash and burn agriculture, particularly sandy dunes, along Save River and the felling of trees for firewood and building material. The great concentration of livestock (cattle, goats and sheep) in fragile habitats has also caused deterioration of soil.
- ☞ Lack of managed development of the tourism potential: Govuro has beautiful beaches and clean waters, all of which are potential tourism attraction;
- ☞ Water supply: Water supply in Govuro is deficient, both in terms of quantity and quality. The principal causes of water supply problems are obsolescence of the general water mains in the main village, insufficient and lack on maintenance of wells in the villages.
- ☞ Urgent need to improve and enlarge infrastructures: This includes rehabilitation of existing infrastructures (schools, health centres, roads, wells and others) and building of new ones to overcome the demand and promote a development of tourism in the district.

## 8. ZONATION

The sustainable conservation of natural resources in Nova Mambone will be based on an adaptive and community-based management approach, allowing multiple uses in the area. An important aspect of management is the division of the area into zones for different uses so that the multiple-use goals of conservation, tourism and utilization by communities can be achieved. Although the concept of zoning is usually applied in a Protected Area, it will be essential to implement it in Nova Mambone in order to ensure that:

- ☞ Local community recognise the flooded areas for better adaptation;
- ☞ Sensitive and critical habitats are protected from damaging activities;
- ☞ Economic activities are separated to avoid conflicts;
- ☞ Intensive use (fishing, agriculture) is confined to areas that can sustain it.

This zoning programme identified the following areas:

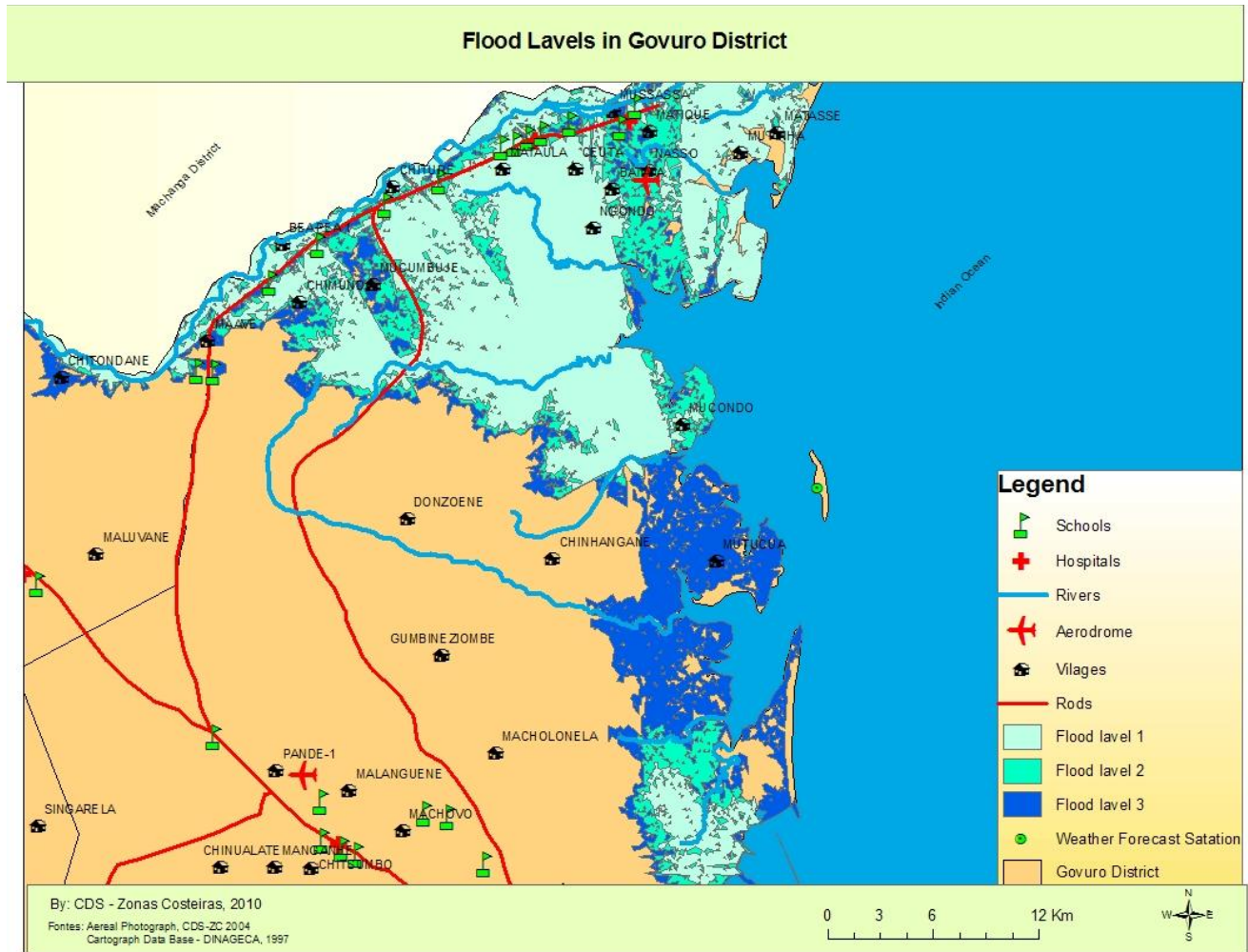
### *8.1 - Flooded areas*

Flood plain and areas near to rivers, because of their special condition are suitable condition for social and economical activities and usually, they are affected by different flood hazards. However in these zones determination of flood zone and its height and also detecting properties of floods in different return periods is most important. So flood zonation is necessary for suitable development and main parameter for investigating of ecological and environmental effect (Mohseniet. al, 2001).

With increase in agricultural activities along rivers and concentration of population around submergible areas, the flood-induced damages are in increasing trend. The complete flood protection with installation of great flood control structures like flood dams are not justified due to its high cost. It is not environmentally, socially and economically an optimum idea either. For this reason, the flood zonation can have a considerable role in flood management through logical utilization of weir gates and dam reservoirs. In this direction, different systems have been innovated in different countries of the world, but lack of equipment and tools and also high cost of installation are the limiting factors (Mohseniet. al, 2001).

The overall aim of this study was to find out the efficiency of GIS to create the main inputs to simulate a comprehensive hydrological model. A Landsat ETM+ (Enhanced Thematic Mapper Plus) imagery and Topographic maps (scale1:50,000) were used to develop the model.

The resulted map of flooded areas has been qualitatively ranked into three levels, namely, level 1 (low), level 2 (moderate) and level 3 (high) flood hazard zones in terms of covered area (**Map.....**). According to the map, Nova Mambone locality is the most affected by floods in the district.



**Map 9.** Coastal Flood Hazard Zonation Map of the study area

The level one flood affects less area than flood level three and consequently has less impact in the number of affected both population and infrastructure (**Table 12**). Details on the impacts of different levels of flood are presented in **annex...**

**Table 12.** Impact of different flood levels on population and infrastructure

	Level 1	Level 2	Level 3
Number of population affected	1.1066	1.1812	1.1628
Number of school affected	11	12	12
Number of health centres affected	1	3	3

The flood hazard and land development maps in digital form can be used as a data base, which can be shared among the various government and non-government agencies, responsible for the construction and development of flood protection measures.

## *8.2 - Core areas*

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Core areas cover habitats that have high conservation values, are vulnerable to disturbance, and can only tolerate a minimum of human use. These core areas need to be large enough to sustain breeding populations of key species and their support systems and to be in relatively pristine condition.

These areas include mangroves surrounding the Save estuary and Govuro coast (**Map 10**) which are important for biodiversity conservation, providing spawning grounds and nurseries for many marine species, but also acting as a filtering system for silt brought down rivers. Most areas of mangroves in Mozambique have been heavily utilized by man and the unspoilt mangroves observed in the Nova Mambone represent a rare exception to this.

The floodplains, grasslands and lowland woodlands (**Map 10**) are also of conservation importance since they constitute a large mammal reservoir area, including endangered species such as wild dog, which use open habitats as hunting grounds. These areas were also ranked as having the most tourism potential due to the abundance and diversity of wildlife, the diversity of specialized tourism activities that can be practiced there and their high scenic value.

The habitat with most conservation value was the lowland forest which was also fairly undisturbed.

## *8.3 - Community Areas:*

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which cover areas that are important for local human use, including some extractive use. These areas go for approximately 5 Km from the villages.

## *8.4 - Multiple-Use Areas:*

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Multiple use cover areas with human settlements and farming grounds, as well as coastal areas where tourism and fishing activities will also be developed.

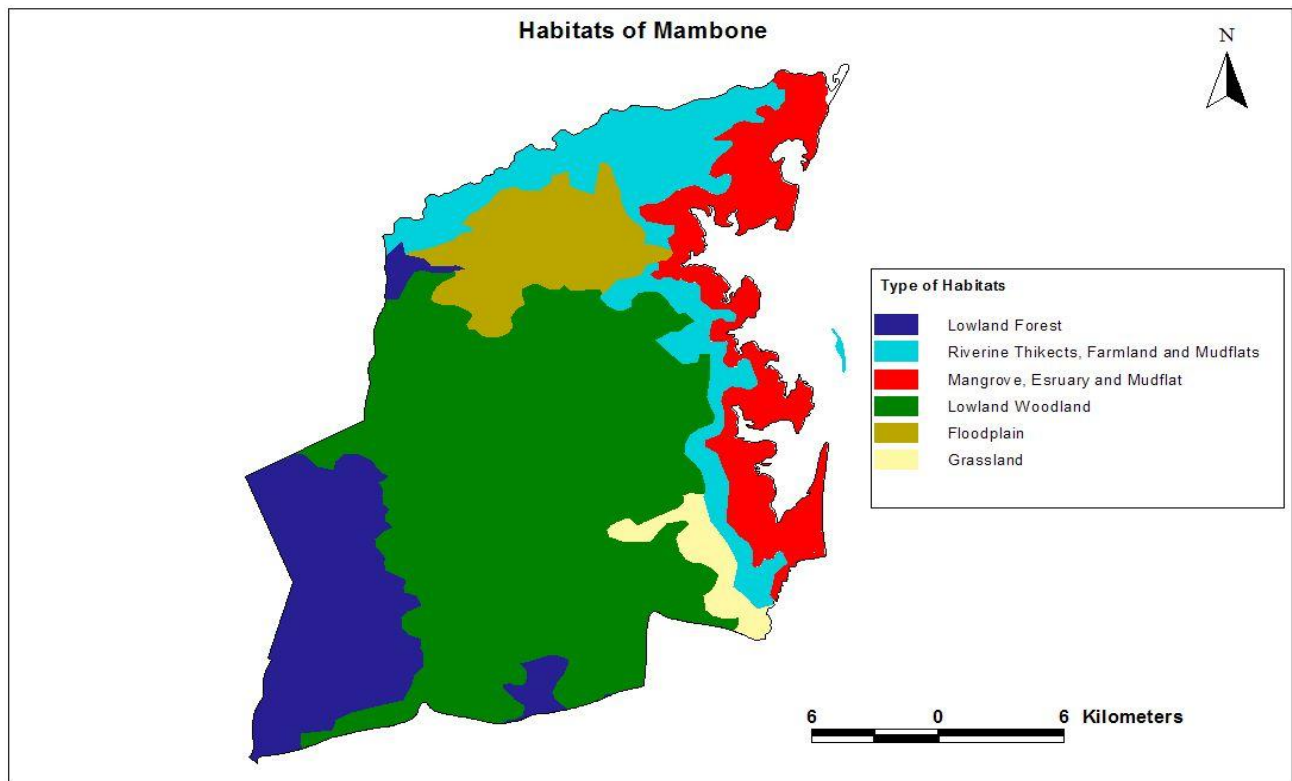
The most valuable terrestrial habitats for local communities in the Nova Mambone were identified as the farmlands and thickets (**Map 10**), situated directly around the villages, where farming, livestock rearing and extractive uses of natural resources are practiced, together with the woodland where villagers collect building materials during the dry season.

The woodland and thicket (**Map 10**) are also used by large mammals, especially elephants during the rainy season when lower grounds are flooded and during the dry season when they go to drink near the coast. Furthermore, coastal thickets have also an inherent conservation value as being part of the Coastal Forest hotspot. The sections of these habitats should become Community Wildlife Areas, with resource use being permitted but regulated through community-based mechanisms.

Results from the present study are compiled in **Table 13** where the importance of each habitat category was scored on a simple scale ranking from Low, Medium, High to Very High.

**Table 13.** Relative value of each category for local communities, biodiversity conservation and tourism development

Habitat type	Local value	Conservation value	Tourism value
Coastal & marine	Very High	High	Very High
Mangroves, estuary, Mud flat	High	High	High
Floodplains, grasslands, riverine thickets	Low	Very High	Very High
Lowland woodland	Low	High	High
Riverine thickets00 & farmlands	Very High	High	Low
Lowland forest, riverine forest	Medium	Very High	High



**Map 10:** Habitats and their uses in Nova Mambone



## 9. MANAGEMENT PLAN FOR NATURAL RESOURCES

The main objectives of this management plan for natural resources are to ensure the community-based conservation of natural resource in the district and to contribute to the socio-economic development of communities.

In particular, the management objectives of this plan are:

- ☞ To protect and maintain the biological diversity and natural resources, as well as ecosystem processes;
- ☞ To ensure community participation in management decisions and activities;
- ☞ To promote sound management practices for sustainable production purposes;
- ☞ To contribute to the socio-economic development of local communities;
- ☞ To provide opportunities for research and education.

### *Human / Wildlife Conflict*

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The conflict between humans and wildlife is known to be a nationwide problem in Mozambique. In northern region of Mozambique the main conflict is between Human and elephant (Human- Elephant Conflict) and there are systematic recording of damage to crops and direct attacks of people or destruction of buildings and wells by elephants.

In Govuro there are no recordings of Human- Elephant Conflict, but other species are also involved in crop damage, such as antelopes, baboons, wild pig and birds.

One strategy which has also been recommended by the government is to group crops in blocs.

### *Protection of endangered species*

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Protected species in the district include elephants, wild dog and sea turtles.

The main threats to elephant are represented by Human-Elephant Conflict (HEC) and habitat fragmentation. Because of the negative impact that HEC has on local people's livelihood, there is a very negative attitude towards elephants, with a request from the population to eliminate elephants. A common threat to both elephant and wild dog is represented by habitat fragmentation.

Mitigation of HEC should remain a priority, together with the long-term prevention of the conflict through better land-use planning. It is also important that local people see some benefits through the development of tourism activities in the area.

Prevention of commercial poaching of elephants also needs to be ensured with appropriate protection of wildlife areas through both community-based mechanisms and security network with government and management teams of other conservation areas (Zinave National Park).

The main threat to turtles is predation by man for meat consumption and for trade in turtleshell, either through the accidental or the intentional capture of specimens.

The threats can be reduced through the protection of nesting beaches, and awareness campaigns and incentive programmes conducted with local fishermen. Fishermen have to be encouraged to bring alive the turtles they catch in their nets instead of killing them while the legislation pertaining to the protection of these species have to be divulged in villages with support from local government and community-based management institutions (CCPs).

### *Hunting pressure*

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There are strong indications that wildlife populations in the district are under constant hunting pressure, reflected by the presence of wild meat being sold in local market every day. Other indication is that game species are not observed directly, due to nocturnal habits and low densities.

The following strategies are important to reduce hunting pressure:

- ☞ Development and implementation of regular patrols in the area;
- ☞ Include local residents in the patrol team part of which can be actual hunters;
- ☞ Sensibilisation campaigns in local communities on the need to decrease hunting activities;
- ☞ Collaborative work with local government on law enforcement.

This can result in an increase in wildlife densities and a change of habits in wildlife, which can be seen during the day in some open areas where they would have never ventured before.

### *Fires and habitat loss*

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Bush fires represent a serious threat to the area as they occur every year in the District towards the mid-end of the dry season. They are usually set on purpose by farmers who are preparing an area for cultivation and or by hunters in and outside the district. Because they are not controlled, these fires propagate very rapidly and can damage large tracts of wild lands. Early burning of open areas and sensibilisation campaigns in the villages, together with tighter law enforcement during that time of the year, have to be implemented.

## **9.1 - MANAGEMENT STRATEGIES**

### *a) Protection of Natural Resources*

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- Detailed study of resource use patterns
- Establishment of community-based mechanisms to regulate resource use in the District including natural resources management committee in each village.
- Enhancement of awareness and relevant technical capacity of local people.
- Assessment of hunting practices and use of bushmeat in communities
- Community-based control of illegal activities
- Training of guards in law enforcement by government
- Implement zoning programme
- Strong campaigns against inappropriate use of forest, mangroves and wild animals;
- Replanting where there has been excessive cutting;
- Protection, zoning and regulation of critical ecosystem like mangroves;
- Increased technical assistance to coastal agriculture;
- Promote soil conservation through adoption of better farming practises;
- Develop alternative energy sources

### *b) Monitoring Resource Base and Resource Use*

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#### Marine Natural Resources :

- Survey & monitoring of fisheries
- Survey standing stocks, catch data, socioeconomic issues with fishermen;
- Development of fishery management plans
- Development and implementation of regulations on fishing activities (catch/size limits etc)
- EIA for projects with impact on fisheries;
- Enforce the 100m buffer zone in costal zone.

Terrestrial natural resources: Survey of coastal forests, thickets, mangroves and other habitats using participatory methods.

- Wildlife monitoring
- Resource use monitoring
- Botanical surveys
- Survey of bush meat trade

### *c) Research endangered species*

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- Assessment of distribution, population trends, local values
- Survey of endemic species
- Ecology endangered species

### *d) Livelihood*

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- Assistance for improving social services (health, education, water);
- Expand agricultural, fishery and livestock rearing programme;

- Creation of incentives to develop other small businesses.

*e) Environmental awareness & capacity building*

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- Use of endangered species as flagship for awareness campaign
- Training more local people in conservation management

## 10. CONCLUSIONS

The implementation of the project in Govuro was possible essentially due to the following factors:

- Favourable national framework conditions: In Mozambique the framework conditions are relatively good for the success of participation-oriented approaches in resource management. This has manifested itself in the development of national plans and programs that emphasise participation by the population and decentralization of the responsibility for land-use decisions as the critical prerequisites for sustainable resource management.
- Existing will of the local Government, technicians and village population: The willingness of the technicians and village population to practice self-help in connection with resource-conservation measures and climate change grew with the progress of the implementation of the project.
- The existence of village level organizations: The existence of organizations at the village level in the project area (both traditional and established by Government) has been highly advantageous for the project because they have facilitated the communication and data gathering.
- The method of land use planning: The village (participatory) land use planning approach used is successful, because it is performed within the context of a dialogue between the villagers and the project. The villagers contribute knowledge of and experience with the environment, and this body of information then constitutes the bases for joint analysis of the main problems and identification of the ways to get them under control. This approach has stimulated positive changes in attitudes and behaviours in the villages. The village's population is gaining a new perspective, encouraging it to stay put and endeavour more strongly to conserve its natural resources.
- The increasing pressure of problems: Frequent natural disasters and continued inappropriate use is leading to accelerated degradation and destruction of natural resources. Shrinking croplands, falling yields and other problems are rapidly causing deterioration of living conditions in the village communities. The people in Govuro are consequently forced to devote thought to ways of solving the problems afflicting their own habitat.
- National Campaigns: The willingness of the village population to practice self-help in connection with resource-conservation measures and adaptation to climate related problems has been influenced by national programs and campaigns, aimed at raising their awareness of the problems and disseminating information about suitable ways of addressing them. For example, traditionally people were not keen on planting trees. However, as a result of systematic education and information campaigns by

state services and NGOs, the population of Govuro has become increasingly aware of the role played by the vegetation of plants in their environment.

## 11. RECOMMENDATIONS

Based on the socioeconomic information and the consultations in the district, the following recommendations are necessary to overcome the existing problems for integrated development of the district:

- Establishment and improvement of infrastructures: Improvement and expansion of schools, roads, building of new medical centres, rehabilitation and drilling new boreholes and wells.
- A hydrological survey: to obtain data of ground water, this would make it possible to open new wells in certain places mainly in the centre region of the district, to overcome the water supply problem in this region.
- Establishment of regular transport system: to benefit the population and the development of the tourism industry.
- Education and environmental management: To assist the population of Govuro in recognising the need for a balanced ecosystem and to participate in the formulation and implementation of an action plan for environmental conservation and protection. Emphases should be given to the combat of erosion (along Save River), deforestation and bushfires. The combat of erosion should be done through methods such as the use of trees for establishing the soils.
- Creation of protected nature zones: This would include mangroves, riverine thickets, nesting areas and others, to reduce the lack of harmony between basic human activities and conservation of the environment, in order to coexist in a positive and self-sustaining manner.
- Protection of endangered species: Mainly marine species such as dugongs, sea turtles and others.
- Reduction of use of the natural forest: Reduction of use of forest as source of firewood, charcoal, timber and building material for selling. This could be achieved by planting trees for firewood, charcoal, timber and building material and by enforcing payment of fees by all private entities to encourage economising, change to other type of fuel, etc.
- Development of a program for agricultural expansion: An agriculture program inspired by new methods of cultivation should be developed to raise productivity on existing cultivated lots and to introduce and encourage production of foods that are

less land-intensive. This would include the rehabilitation of chemunda dam, for irrigated agriculture.

- Creation of conditions for open-sea fishing: Local fishermen do their fishing near shore. A training program for open-sea fishing techniques should be carried out, which would enable the fishermen of Govuro to catch more fish per day. Coupled with the training program should be a system for financing the purchase of boats, engines and other fishing implements. Another kind of assistance would be technical and financial support for the master artisan builders of wooden boats in the district so that this traditional craft is recuperated. This would decrease the cost of purchasing and maintaining boats.”
- Diversification of the economy: Agriculture, livestock rearing, fishing and tourism seem to be the economic activities most likely to lead the development of the district. However it is important that these be integrated with all other sectors. The development of these activities could create the economic resources necessary to stimulate the diversification of enterprise, thus making viable other commercial alternatives and the production of services. This would reduce the dependency on forest resources as the one mean of support.

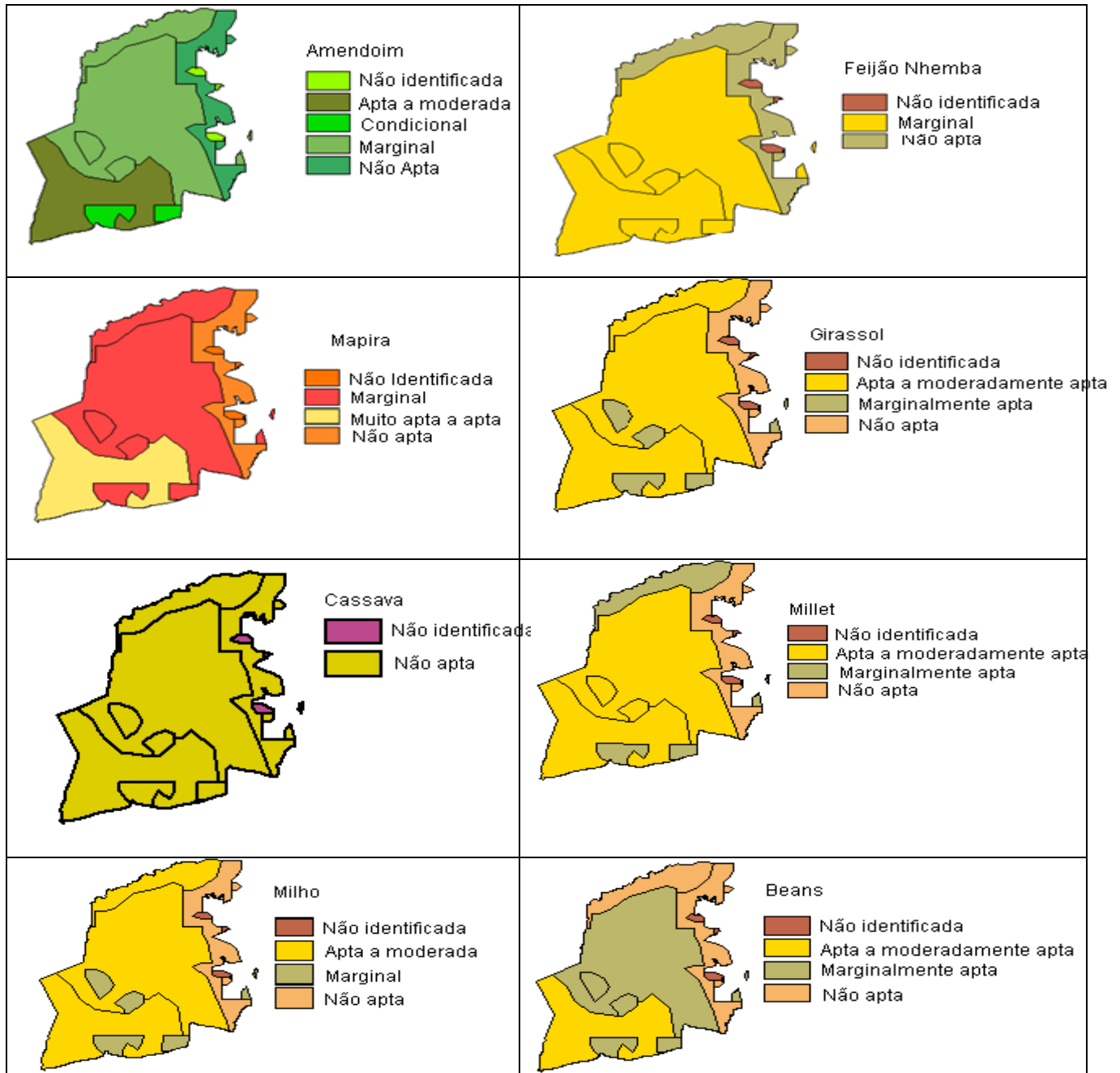
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**ANEX I: Soil suitability for each crop**



**ANEX II: Impact of floods**

Tabela 2 School affected

School affected			
Nome	Level 1	Level 2	Level 3
Localidade de Pande		x	x
Bairro de Mahve	x	x	x
Bairro de Genga	x	x	x
Administracao Distrital	x	x	x
Salas de Alfabetizacao	x	x	x
Bairro de reassentamento			
Povoado de Chibuca	x	x	x
Povoado de Mochovo			
Povoado de Muluvane			
Povoado de Pande			
Povoado de Coloma	x	x	x
EP1 Abandonada	x	x	x
EP1 de Chibuca	x	x	x
EP1 de Chimadje	x	x	x
EP1 de Coloma	x	x	x
EP1 de Colomato			
EP1 de KM 18			
EP1 de Mochovo			
EP1 de Mahve			
EP1 de Palmeira	x	x	x
EP1 de Ruralato			
EPC de Pande			
EPC de Duane			
EPC de Maluvane			
ES de Duane			
Internato De ESN Mambone			
Sede da localidade Pande			
Total	11	12	12
Percentagem(%)	40.7	44.4	44.4

Tabela 3 - Villages affected

- Villages affected							
NOME	Population	Level 1	pop afect.	Level 2	pop afect.	Level 3	pop Afect.
CHICURUANE	50			x	50	x	50
MAVAMBE	329						
ZAVA	84						
MAZINO (NGULA)	133						
CHIBUCA	185						
CHITSUMBO	991						
MANGANHE	480						
CHINUALATE	188						
MACHOVO	393						
MALANGUENE	362						
PANDE-1	996						
MACHOLONELA	210						
ZIOMBE	79						
GUMBINE	68						
MUTUCUA	285					x	285
CHINHANGANE	69						
DONZOENE	108						
MUCONDO	38	x	38				
CHIMUNDA	1416	x	1416				
MUCUMBUJE	854			x	854	x	854
BEA PEA 1	1596	x	1596	x	1596	x	1596
NGONDO	1466	x	1466	x	1466	x	1466
BATATA	1132			x	1132	x	1132
CHITURE	2090	x	2090	x	2090	x	2090
NASSO	357	x	357	x	357	x	357
CEUTA	905	x	905	x	905	x	905
MATAULA	1892	x					
MUTINHA	337						
MATASSE	1206	x	1206	x	1206	x	1206
MATIQUE	1523	x	1523				
MUSSASSA	469		469	x	469	x	

Vila de Mambone	1687			x	1687	x	1687
TOTAL	21978	10	11066	11	11812	12	11628
Percentagem(%)	100.0	33.3	50.4	36.7	53.7	40.0	52.9

Tabela 4 Health centres and aerodrome

Name	Health centres and aerodrome		
	Level 1	Level 2	Level 3
Centro de saude		x	x
Centro de saude Nova Mambone	x	x	x
Centro de saude			
Centro de saude			
Campo de aviacao (aerodromos)		x	x
Campo de recurso (aerodromos)			
Total	1	3	3